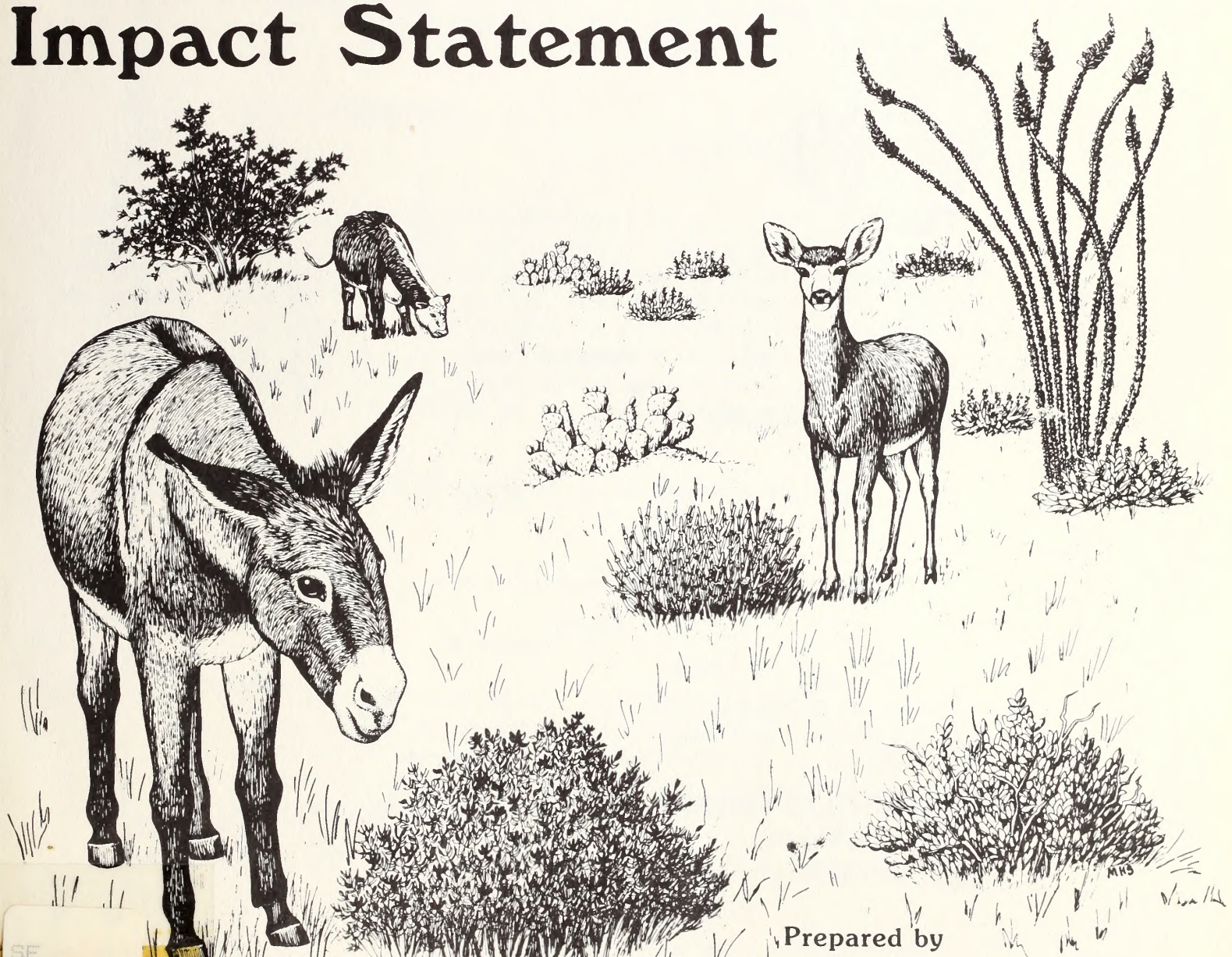
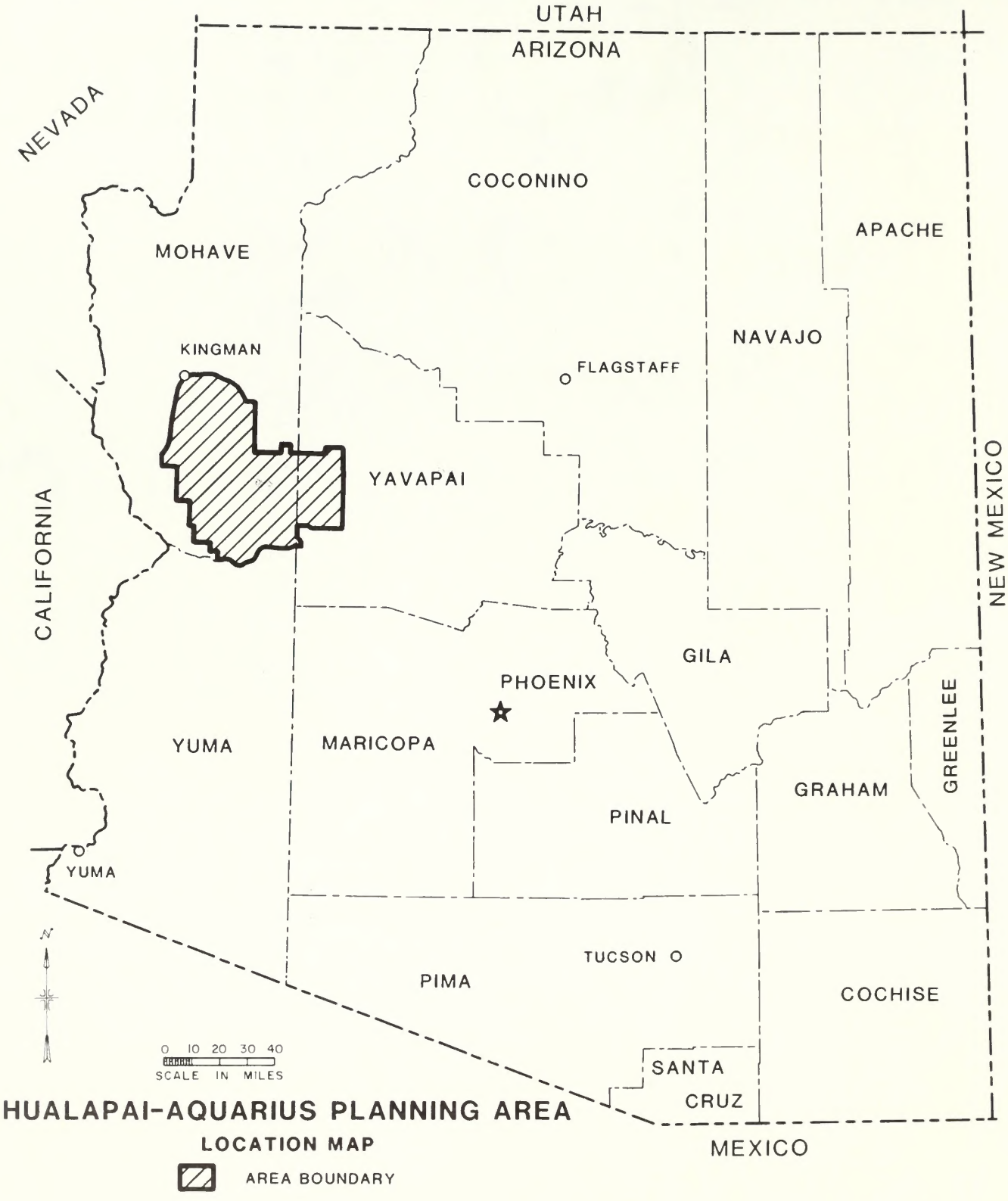
HUALAPAI - AQUARIUS

Draft Grazing Environmental Impact Statement



Prepared by
U.S. Department of the Interior
Bureau of Land Management
Arizona



HUALAPAI-AQUARIUS PLANNING AREA

LOCATION MAP

AREA BOUNDARY

IN REPLY REFER TO

United States Department of the Interior

BUREAU OF LAND MANAGEMENT

PHOENIX DISTRICT OFFICE
2929 WEST CLARENDON AVENUE
PHOENIX, ARIZONA 85017

Notice

Two public hearings have been scheduled to receive oral and written testimony on this draft environmental impact statement. The hearings will take place at 7:30 p.m. in Kingman and Phoenix, Arizona at the following locations:

April 22	April 23
Mohave County Fairgrounds	Rodeway Inn
North Wing	3400 Grand Avenue
Kingman, Arizona	Phoenix, Arizona

Persons wishing to give oral testimony will be limited to 5 minutes, with written submissions invited at the hearing. Before giving testimony, individuals are requested to notify Jim Crisp, Team Leader, Bureau of Land Management, 2929 W. Clarendon Avenue, Phoenix, Arizona 85017, telephone (602) 241-2852. Notification should be made no later than 3 working days before the hearing to allow BLM time to prepare a list of speakers in the order they will be called. Witnesses should direct their testimony to the contents of the document and to specific aspects of the grazing management proposal or its alternatives.

Written statements will be accepted on or before May 12, 1981.

Errata

1. As the draft environmental impact statement was going to print, final rulemaking was published amending the grazing regulations (43 CFR 4100) to allow a five-year phase-in of proposed reductions or increases in livestock grazing and to require greater consultation before issuing grazing decisions. These amendments will affect the proposed action and all of the alternatives except Continuation of Present Grazing Management. The final environmental impact statement will reflect the amendments in full.

Continued on Reverse

IN REPLY REFER TO:

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
ARIZONA STATE OFFICE
2400 VALLEY BANK CENTER
PHOENIX, ARIZONA 85073

Enclosed for your review and comment is the draft environmental impact statement for the proposed grazing management program for the Hualapai-Aquarius Planning Area in Mohave and Yavapai Counties, Arizona.

The environmental impact statement is based on information from the Bureau of Land Management and other sources including Federal, State, and local agencies, private organizations, and interested individuals. The purpose of the statement is to disclose in advance the probable environmental impacts of the proposed action and its alternatives, and to assure that these factors are considered along with economic, technical, and other considerations in the decisionmaking process.

We would appreciate receiving your comments on the draft statement. The comment period will run for 60 days after the draft is filed with the Environmental Protection Agency and the notice of receipt is published in the Federal Register. The notice is anticipated in March 1981. A public hearing will be held in Kingman, Arizona, details of which will be advertised. Comments received after the 60-day review period will be considered in the subsequent decision process, even though they may be too late for inclusion in the final environmental impact statement.

Your comments should be sent to:

Arizona State Director
Bureau of Land Management
2400 Valley Bank Center
Phoenix, Arizona 85073

Sincerely,

Clair M. Whitlock
State Director

DRAFT

ENVIRONMENTAL IMPACT STATEMENT

PROPOSED GRAZING MANAGEMENT PROGRAM

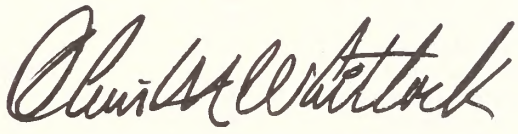
for the

HUALAPAI-AQUARIUS EIS AREA

MOHAVE and YAVAPAI COUNTIES, ARIZONA

Prepared by

DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
PHOENIX DISTRICT



State Director

Arizona State Office

The Bureau of Land Management proposes to implement a grazing management program within portions of the Hualapai-Aquarius Planning Area. The program would allocate vegetation to livestock, big game, and wild burros. The proposal recommends levels of livestock grazing management, identifies needed rangeland developments, and outlines a schedule of implementation. Measures to protect or enhance environmental resources have been incorporated into the program. Alternatives considered in addition to the proposed action include Continuation of Present Grazing Management (No Action), Moderate Grazing Management, Wildlife Enhancement, and Elimination of Livestock Grazing. A concise description of the affected environment and an analysis of the environmental consequences resulting from the proposed action and each alternative are included in the document.

For Further Information Contact: Jim Crisp, EIS Team Leader, Phoenix District, Bureau of Land Management, 2929 W. Clarendon Ave, Phoenix, Arizona 85017 or call (602) 241-2852

Comments on the Draft EIS are due: MAY 12 1981

NOTICE TO READERS

Please keep this draft EIS for possible use as part of the final EIS. Council on Environmental Quality regulations [43 CFR 1503.4(c)] provide for circulation of abbreviated final EISs where major changes to the draft are not required. If the public review requires only minor changes to the draft, then the final EIS will consist of this draft and a supplement containing public comments, responses to comments, and necessary changes and corrections. This procedure will cut printing costs and speed up the environmental process.

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LIST OF PREPARERS

Name	Position	EIS Assignment	Education	Experience
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William K. Carter	Environmental Coordinator	Technical Coordination	B.S. Agronomy, Kansas State University	14 years BLM
Julian Anderson	Range Conservationist	Technical Coordination	B.S. Range Management, Utah State University	16 years BLM
Herbert K. McGinty	Writer-Editor	Total EIS Coordination and Editorial Review	B.A. History, Duke University; M.A. Geography, Clark University; Certificate of Accomplishment in Editorial Practices, Department of Agriculture Graduate School	4-1/2 years BLM 3-1/2 years U.S. Geological Survey
Hank Molz	Outdoor Recreation Planner	Recreation, Wilderness, Visual Resources - Chapters 3 and 4	B.S. Forestry, Art Minor, Northern Arizona University	10-1/2 years BLM 2 years Arizona State Parks
Ted Cordery	Wildlife Biologist	Wildlife - Chapters 2, 3, and 4	B.S. Wildlife Management (Range Management Emphasis), Humboldt State University	5 years BLM
Robert Mitchell	Range Conservationist	Vegetation - Chapters 2, 3, and 4	B.S. Range Management, Humboldt State University	6-1/2 years BLM
Kelly Grissom	Range Conservationist	Livestock and Burros - Chapters 3 and 4	B.S. Agronomy (Range Management Option), Oklahoma State University	4-1/2 years BLM 1 year OSU
Pat Giorgi	Archaeologist	Cultural Resources - Chapters 3 and 4	B.A. Anthropology, University of New York at Albany	4-1/2 years BLM
Pete Wilkins	Hydrologist	Water Resources and Sediment Yield - Chapters 3 and 4	B.S. Renewable Natural Resources (Watershed Management Major), University of Nevada, Reno	2-1/2 years BLM
Tom Craft	Soil Scientist	Soils - Chapters 3 and 4	B.S. Soils and Agronomy, Oklahoma State University; Post Graduate Work - Soils, Iowa State University	4 years BLM 14 years SCS
Tim L. Sanders	Regional Economist	Economic Conditions - Chapters 3 and 4	B.S. Wildlife Biology, M.S. Agricultural Economics, New Mexico State University	1-1/2 years BLM
Keith Pearson	Social Analyst	Social Attitudes - Chapters 3 and 4	B.A. History, Augustana College; M.A., Ph.D. Anthropology, University of Arizona	6 years BLM
Wes Gehres	Range Conservationist	Chapter 2 and Technical Coordination	B.S. Forest-Range Management, Utah State University	5-1/2 years BLM
Hector B. Abrego	Range Conservationist	Summaries and Technical Coordination	B.S. Range Science, Texas A&M University	3 years BLM
Karen Daniels	Clerk Typist	Word Processor Operation and Technical Coordination	Idaho State University	1 year BLM 1 year Forest Service 1 year U.S. Navy

LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THE STATEMENT ARE SENT

BLM will request comments on the draft EIS from grazing permittees, interested individuals, and the following agencies and interest groups:

Federal Agencies

Advisory Council on Historic Preservation
Environmental Protection Agency
Department of Agriculture
- Agricultural Stabilization and Conservation Service
- Economics, Statistics, and Cooperatives Service
- Forest Service
- Science and Education Administration
- Soil Conservation Service

Department of Defense
- Corps of Engineers

Department of the Interior
- Bureau of Indian Affairs
- Fish and Wildlife Service
- Geological Survey
- Heritage Conservation and Recreation Service
- National Park Service
- Water and Power Resources Service

Arizona State Agencies

Arizona Agriculture and Horticulture Commission
Arizona Department of Transportation
Arizona Game and Fish Department
Arizona Office of Economic Planning and Development
Arizona State Clearinghouse
Arizona State Historic Preservation Officer
Arizona State Land Commissioner
Arizona State Parks Board
Big Sandy Natural Resource Conservation District
District IV Council of Governments
Northern Arizona Council of Governments
University of Arizona

Local Agencies

City of Kingman
Mohave County Board of Supervisors
Mohave County Extension Service
Mohave County Planning Department
Yavapai County Board of Supervisors

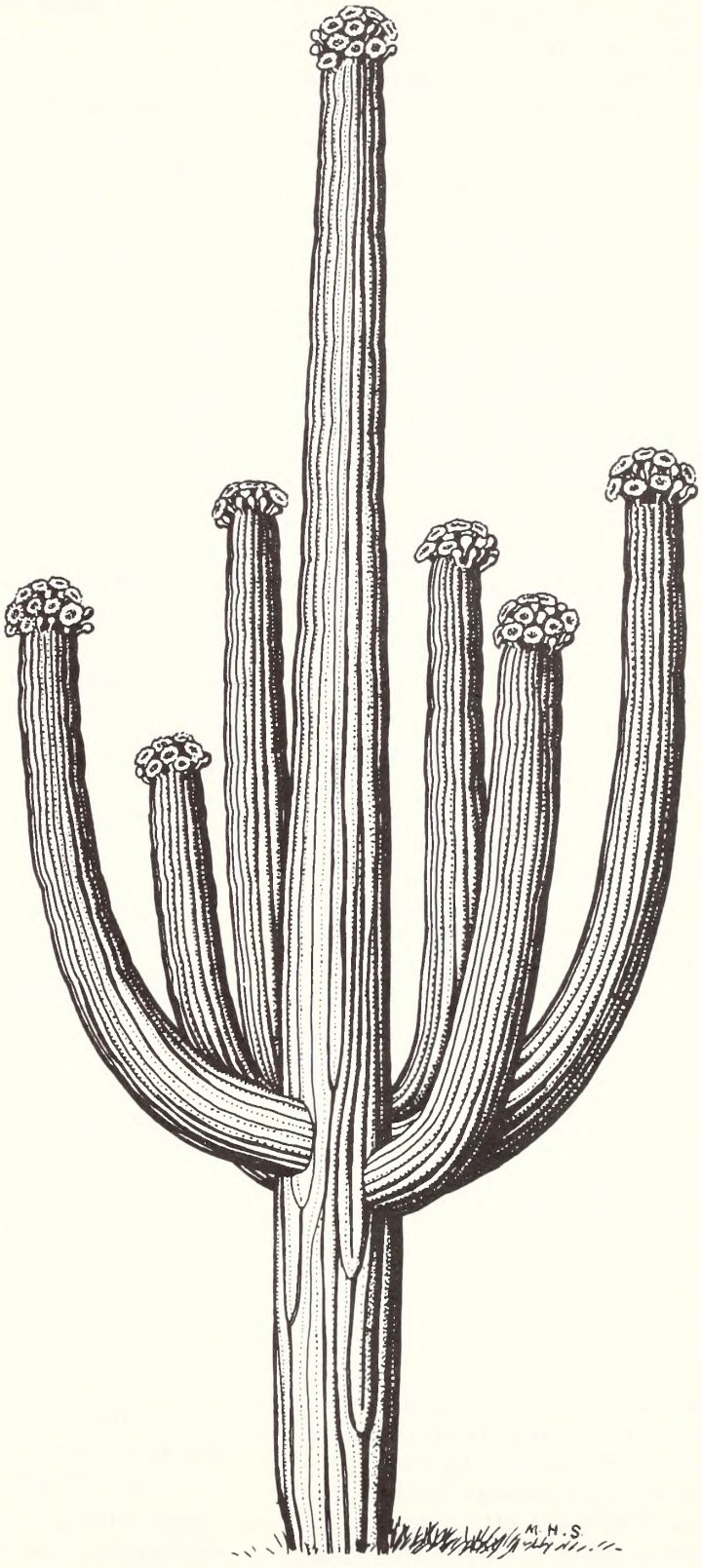
Other Organizations

Arizona Cattle Growers Association
Arizona Desert Bighorn Sheep Society
Arizona 4-Wheel Drive Association
Arizona Wildlife Federation
Arizona Wildlife Society
Arizona Wool Growers Association
Audubon Society
Defenders of Wildlife
Federal Land Bank Association
Fund for Animals
International Society for the Protection of Mustangs and Burros
Isaak Walton League of America
League of Women Voters
Mohave County Cattle Growers Association
Mohave County Farm Bureau
National Council of Public Land Users
Natural Resources Defense Council
Public Land Council
Sierra Club
Society for Range Management
Wilderness Society
Wild Horse Organized Assistance

Congressional Delegations

Representative Bob Stump
Senator Dennis DeConcini
Senator Barry Goldwater

SUMMARY



SAGUARO

SUMMARY

PURPOSE AND NEED

The Bureau of Land Management (BLM) proposes the implementation of a grazing management program for the Hualapai-Aquarius Environmental Impact Statement (EIS) area in Mohave and Yavapai Counties, Arizona. The EIS area encompasses 856,749 acres of public lands, 358,687 acres of State land, and 93,152 acres of private land.

This EIS responds to requirements of the National Environmental Policy Act of 1969 to analyze the impacts of projects having significant effects on the environment and to the Federal Land Policy and Management Act's mandate to provide for the orderly use and development of public rangelands and to preserve the land and its resources.

The overall objective of the rangeland management program is to improve the productivity of rangelands and to fulfill social, economic, and environmental needs within the EIS area.

To help "scope" and summarize significant issues concerning the proposed rangeland management program, BLM held a series of meetings and open houses between December of 1979 and June of 1980 to get the public involved in the review and analysis of management recommendations. Many of the issues discussed in this EIS have come out of this scoping process.

ALTERNATIVES INCLUDING THE PROPOSED ACTION

This EIS analyzes the following five alternative rangeland management programs, including the proposed action.

The *proposed grazing management program* (proposed action) was developed as part of the Hualapai-Aquarius Land Use Plan and corresponds to recommendations for rangeland management in Step 2 of the Hualapai-Aquarius Management Framework Plan (MFP). The proposed action calls for the following measures:

- Allocation of forage to livestock, wild burros, and big game so that average annual utilization of key forage species would not exceed an average of 50 percent.
- Intensive grazing management on 28 allotments, less intensive management on 4 allotments, nonintensive management on 15 allotments, and ephemeral grazing management on 4 allotments.
- The construction of the following rangeland developments to help implement grazing systems and improve livestock distribution where no grazing system will be implemented: 365 water developments, 112 miles of pipeline, 266 miles of fence, 37 cattleguards, and 8 miles of stock trail.

The proposed action's goal is to attain specific management objectives within 20 years of implementation. The stages of implementation are as follows.

(1) Adjust livestock numbers to initial stocking rates.

(2) Remove excess wild burros upon approval of herd management area plan.

(3) Begin rangeland trend and utilization studies.

(4) Construct water developments and fences.

(5) Implement grazing systems.

Actual use, utilization, trend, climate, and wildlife studies would help determine how well specific objectives are being met and at what level future stocking rates should be set.

The *continuation of present grazing management* alternative (no action) proposes no change in grazing from the present. Stocking levels would remain at recognized active preferences, and forage would not be allocated to burros and big game. BLM would hold wild burro populations to existing numbers. No intensive grazing systems would be developed. Yearlong grazing would continue on 32 allotments, nonintensive grazing on 14 allotments, and ephemeral grazing on 2 allotments. BLM would construct rangeland developments needed for the orderly use of the range.

Moderate grazing management, a less-costly and less-intensive alternative to the proposed action, proposes no intensive grazing systems, but BLM would specify livestock numbers, kind of livestock, period of use, and rangeland development needs. Initial stocking rates would be set at 10 percent below those of the proposed action. Average utilization of key forage species would be limited to 45 percent. As under no action, existing rangeland developments would be maintained, and new developments would be built as needed for the orderly use of the range.

The *wildlife enhancement alternative* was developed to include wildlife enhancement measures recommended in the Hualapai-Aquarius Management Framework Plan (MFP) Step 1 but dropped during the MFP Step 2 multiple-use analysis. This alternative would allocate forage for the rangeland's estimated carrying capacity for big game. Average utilization of forage would be held to 40 percent, and initial stocking levels would be set 20 percent below the level of the proposed action,

except on allotments lacking livestock-big game conflicts. Grazing management would be the same as under the proposed action, except ephemeral grazing would not be authorized in desert tortoise crucial habitat and riparian habitats would be fenced from livestock and burro grazing. Rangeland developments would be constructed as under the proposed action except where constrained by wildlife MFP Step 1 recommendations.

The *elimination of livestock grazing* alternative would cancel all grazing preference on public lands. BLM would allocate forage and construct and maintain rangeland developments for big game, burros, and other resources. To keep livestock off public lands, 1,500 miles of fence, 60 cattleguards, and 100 manual gates may be required. Livestock grazing would be phased out over a 3-year period. BLM would continue to monitor the rangeland for trespass and wildlife conditions.

Mitigating measures for resource protection and enhancement have been incorporated into the proposed action and alternatives.

ENVIRONMENTAL CONSEQUENCES

VEGETATION

Over a 20-year period, the proposed action and all alternatives except no action would increase usable forage production and plant cover and improve rangeland condition. Vegetation would overall deteriorate under no action. The most dramatic improvement would occur under the proposed action and wildlife enhancement, which would increase annual usable forage production by almost 10 million air dry pounds, increase plant cover by 3 percent, and increase the area in excellent rangeland condition by 226,555 acres.

Riparian vegetation would generally improve under the proposed action, wildlife enhancement, and elimination of livestock grazing. Herbaceous riparian vegetation would show some improvement in vigor and increased reproduction from periodic rest, reduced stocking, and new water developments under the proposed action. Woody plants, however, would remain in poor condition due to concentrated use by grazing animals. Under wildlife enhancement and elmination of livestock grazing, the fencing of riparian areas would promptly improve vigor and production of overutilized vegetation and encourage regeneration of broadleaf trees. Grasses and forbs would dominate the understory. Under these two alternatives, usable forage production in riparian areas would increase from 165 to 212 pounds per acre, and plant cover would increase from 26 to 39 percent. Riparian areas in good condition would increase from 37 to 4,431 acres, and areas in excellent condition would increase from 0 to 163 acres.

In the long term, rangeland developments and livestock concentration around new waters would permanently disturb the following acreage of vegetation and soil: proposed action—228 acres, no action and moderate grazing management—111 acres, wildlife enhancement—197 acres, elimination of livestock grazing—156 acres.

SOILS

All alternatives except no action would generally benefit soils. Increased vegetation production resulting from livestock and wild burro reductions would increase ground cover (litter and vegetation) and reduce soil movement and raindrop impact. These actions would decrease soil compaction, increasing water infiltration rates and water retention in the soils. Soil movement and erosion would decline. Average sediment yield would also decline slightly under the proposed action, moderate grazing, and wildlife enhancement from 0.33 to 0.32 acre-feet/square mile/year. Under the elimination of livestock grazing, average sediment yield would drop to 0.30 acre-feet/square mile/year.

The no-action alternative would generally decrease ground cover and increase soil movement and erosion. Soil compaction would increase, reducing water infiltration rates and water retention in the soils. Average sediment yield would increase to 0.36 acre-feet/square mile/year.

WATER RESOURCES

Wildlife enhancement and elimination of livestock grazing would most benefit water quality in the EIS area, reducing runoff, sediment, and nutrient pollutants. The proposed action would reduce nutrient pollution and runoff and might reduce sediment and fecal coliform. Continuing present management would increase sediment and runoff but not affect nutrient pollutants or fecal coliform. Moderate grazing management would not affect sediments and nutrient pollutants but would reduce runoff and might increase fecal coliform.

New water developments would increase surface storage capacity by 49.5 acre-feet under the proposed action, 26.6 acre-feet under no action and moderate grazing management, and 22.9 acre-feet under wildlife enhancement. Surface storage capacity would insignificantly change under elimination of livestock grazing.

WILDLIFE

Wildlife enhancement would benefit wildlife habitat the most followed by elimination of livestock, the proposed action, and moderate grazing manage-

ment. Reducing livestock and burro numbers under all alternatives except no action would lessen competition among forage users and bring grazing in the EIS area in line with the estimated carrying capacity. The resulting improvement in big-game habitat would lead to increases in big-game numbers, the greatest increase occurring under the wildlife enhancement alternative. Under no action small-game and nongame habitat would continue to deteriorate, and populations of all big-game species except javelina would decrease.

Riparian habitat quality would continue to degrade under all alternatives except wildlife enhancement and elimination of livestock grazing. In the long term, continuation of present grazing management would lead to only 37 riparian acres being in better than poor condition. Under wildlife enhancement and elimination of livestock grazing, 98 percent of riparian habitat would improve, and no riparian habitat would remain in poor condition.

Rangeland developments would have varied impacts on wildlife. Although no more than 30 nongame bird and mammal species would benefit from new livestock waters, new waters would benefit water-dependent species, allowing them to expand into habitats previously lacking water. Increased food and cover around fenced reservoirs would also enhance habitats. Intensive livestock use around each new water, however, would reduce protective cover and forage and increase the vulnerability of prey species to predators. Fence construction would interfere with elk, mule deer, pronghorn, and bighorn sheep movement, resulting in some death by entanglement and possible changes in movement patterns.

All alternatives except no action would increase wildfire frequency by increasing fuel production. If fire is allowed to burn significant acreage in certain vegetation types, it would increase the production of forage and cover, especially forbs and browse. Wildfires would also speed up beneficial habitat changes in chaparral and grasslands, improving rangeland condition and benefiting deer, antelope, Gilbert skinks, Gila monsters, and several raptor species.

BURROS

The proposed action and moderate grazing management would reduce the EIS area's burro population by 84 percent (843 to 139 burros) through a live capture program. The captured burros would undergo some stress as would the remaining population, but these alternatives would benefit the remaining population by reducing competition for forage. The wildlife enhancement alternative would also reduce burro populations by 84 percent, but it would eliminate burros on 7,840 acres of riparian habitat, which could severely limit the burro's ability to survive during hot dry months. Eliminating livestock grazing would maintain a herd of 483 burros, which would no longer have to compete with livestock. Although this alternative would require less time to round up excess burros, captured burros would undergo the same level of stress as those captured under the proposed action.

The no-action alternative would adversely impact most burro-use areas by not allocating forage for burros. As grazing animals consume all grazable plants, burro populations would decline. Declining rangeland condition and lowered productivity would harm the health of burro herds.

LIVESTOCK GRAZING

Initial reductions in stocking levels under the proposed action, moderate grazing management, and wildlife enhancement would reduce livestock grazing by 53, 58, and 63 percent respectively from authorized grazing preference. Some operators would be forced to become more dependent on non-Federal forage until forage on public land increases. Twenty years after implementation, however, increased forage would allow stocking levels to rise to the following percentages of authorized grazing preference: proposed action—38 percent, moderate grazing—51 percent, and wildlife enhancement—50 percent. Livestock production under elimination of livestock grazing would decline by over 4,700 head of cattle.

Lower stocking rates under the proposed action, moderate grazing management, and wildlife enhancement would generally increase desirable forage species for livestock, allowing increases in weight gains, percent calf crop, and steer and heifer weaning weights, as well as decreases in the percentage of culled cows. The highest performance would occur under the proposed action and wildlife enhancement alternatives, followed by moderate management. In the long term, these alternatives should make ranching operations more stable by allowing a sustained production of beef. Under continuation of present management, livestock performance would decline.

Intensive grazing management under the proposed action and wildlife enhancement would require livestock to adapt to new terrain, water sources, and increased handling and movement, causing stress that could result in short-term weight losses. Intensive grazing management would also increase the amount of operator labor needed to move livestock, maintain pasture fences, and monitor herds. Lower initial stocking rates on public lands would increase grazing pressure on nearby State and private lands. The elimination of livestock grazing alternative would place severe constraints on the management of many livestock operations in the EIS area.

Rangeland developments under all alternatives except the elimination of livestock grazing would increase

the livestock operation's short-term construction expenses and long-term maintenance expenses.

VISUAL RESOURCES

Through increases or decreases in vegetation cover, production, and composition, all alternatives could change the color and texture of the existing landscape. This change would be gradual and most evident along roads and highways. Short-term and long-term local contrasts would result from rangeland developments. Under elimination of livestock grazing, contrast would be evident along the 1,500 miles of fencing, which would have to follow legal boundaries and would involve some skylining. Contrast ratings will be completed for all rangeland developments to ensure that recommended visual resource management class objectives are met.

CULTURAL RESOURCES

The significant direct impacts of all alternatives on cultural resources would be avoided or mitigated. Cultural resources could thus suffer adverse impacts only inadvertently or indirectly from site erosion, from vandalism due to improved access, and from new rangeland developments, which could impact previously undiscovered cultural resources. Potential direct impacts to cultural resources from livestock trampling and rubbing of surface structures would be insignificant.

The alternatives would differ considerably in the level of their impacts. Eliminating livestock grazing would most benefit cultural resources, since adverse impacts on these resources would substantially decrease. Moderate grazing management would moderately decrease impacts, since rangeland construction would be limited and stocking levels would be almost half of present levels. Under wildlife enhancement, impacts to cultural resources would decrease slightly due to decreased stocking levels and elimination of livestock grazing from riparian areas. The numerous rangeland developments and continued high stocking levels under no action would result in an overall high increase in impacts to cultural resources. The proposed action, however, would have the greatest adverse impact due to the great number of proposed rangeland developments.

RECREATION

All alternatives would measurably impact only hunting and perhaps ORV cross-country use and sightseeing. Increases in big-game populations under all alternatives except no action would increase big-game hunting and opportunities for viewing wildlife. The greatest annual increase in recreation use would occur under wildlife enhancement—24,327 visitor days, followed by the proposed action—21,258 visitor days, and moderate grazing management and the elimination of livestock grazing—18,112 visitor days. Continuation of present grazing management would decrease annual big-game populations and big-game hunting by 4,718 visitor days. Increases in fences under all alternatives would slightly decrease ORV cross-country opportunities.

WILDERNESS

On lands in the EIS area proposed as wilderness study areas, all rangeland management activities will comply with BLM's *Interim Management Policy and Guidelines for Lands under Wilderness Review* (BLM, 1979b). No adverse impacts on wilderness values are thus expected under any alternative.

ECONOMIC AND SOCIAL CONDITIONS

Annual net revenues 20 years after implementation would increase for all three typical ranch sizes under the proposed action. The only other alternatives that would allow increases in net revenues would be moderate grazing management for large ranches and the wildlife enhancement alternative for small and large ranches.

When comparing the present values of expected yearly net revenues over a 30-year period under each alternative, however, only the typical small ranch (67 cows) and the typical large ranch (788 cows) under the proposed action would be financially better off in the long term than under present grazing management. The typical medium-size ranch (212 cows) would be financially hurt under all the alternatives except no action.

Eliminating livestock grazing would hurt ranchers most, forcing some out of business. Some large and medium-size operators might sell their ranches to other operators, which would help form economic units. Other operators might be forced to break their operations into small ranches and find outside employment.

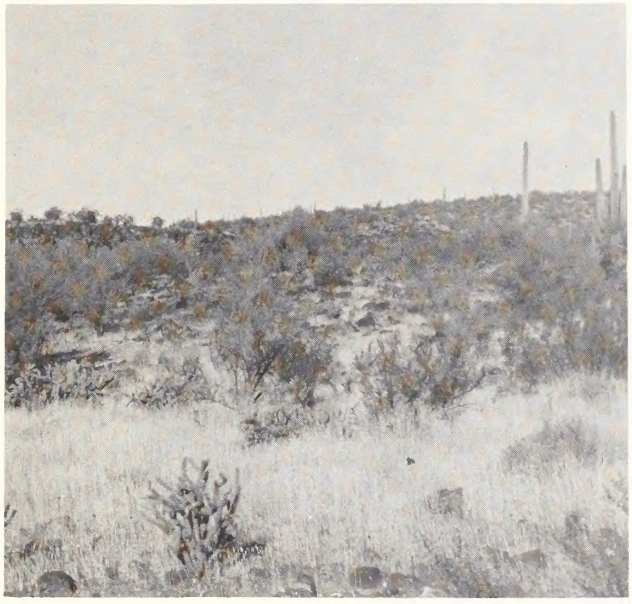
Ranch values under no action would exceed values under all other alternatives except for the small-ranch values under the proposed action. Lower ranch values would reduce the rancher's ability to borrow operating capital and to repay loans.

Over the long term, ranch employment would decrease from that at present under all alternatives.

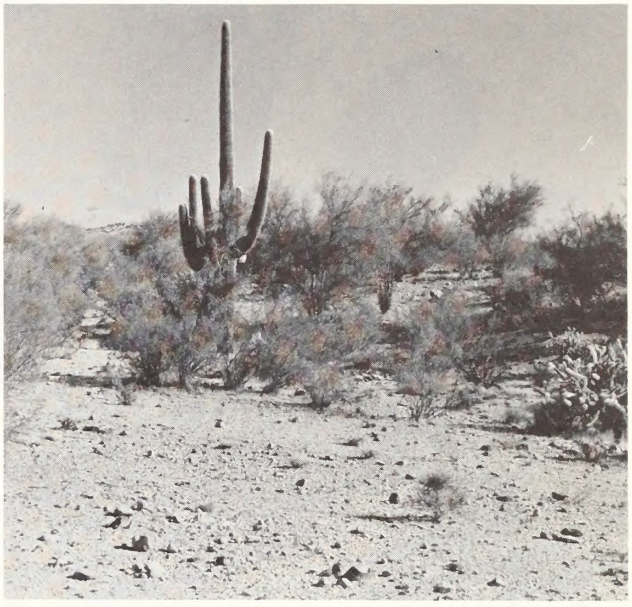
Estimated construction earnings for new rangeland developments would increase during the 5-year period in which developments would be built. The elimination of livestock grazing would increase construction earnings the most, followed by the proposed action, wildlife enhancement, moderate grazing, and no action.

Recreation earnings would increase under all alternatives except no action, supporting 11 new employees under the proposed action, 9.3 new employees under moderate grazing management and elimination of livestock grazing, and 12.5 new employees under wildlife enhancement.

Social perceptions and attitudes of Mohave County residents are not expected to measurably change as a result of a decision to implement any of the alternatives.



Ephemeral forage is abundant.



Ephemeral forage is absent.

Ephemeral Vegetation Plays an Important Role in Desert Rangelands

Much of the EIS area's forage production comes with annual grasses and wildflowers responding to infrequent heavy rains in the late winter or early spring. Such forage is termed ephemeral. A significant amount of ephemeral forage may develop as rarely as 2 or 3 years out of 10. Some livestock operations and many wildlife species rely on ephemeral vegetation for food and cover.

CHAPTER 1
PURPOSE AND NEED

JOSHUA TREE

CHAPTER 1

PURPOSE AND NEED

INTRODUCTION

This environmental impact statement (EIS) considers the possible consequences of five alternatives for grazing management on public rangelands in the Hualapai-Aquarius Planning Area. Grazing programs on these lands are administered by the Bureau of Land Management (BLM) out of the Kingman Resource Area in the Phoenix District. The planning area is located in southern Mohave County and west-central Yavapai County, Arizona and extends from the Bill Williams River on the south to Interstate Highway 40 and the city of Kingman on the north (Map 1-1). Public lands addressed in this study make up 66 percent (856,749 acres) of all lands within the area. State lands make up 7 percent (93,152 acres) and private lands 27 percent (358,687 acres).[1]

Historically, livestock grazing has constituted a major part of the land use throughout the area. The lands have also provided important habitat for a wide variety of wildlife and have supported increasing numbers of wild burros. Competition between these users for limited forage has caused conflicts impacting watershed, water quality, wildlife habitat, and rangeland productivity.

PURPOSE AND NEED FOR ACTION

BLM is under congressional mandate to provide for the orderly use and development of the public rangelands and to preserve the land and its resources from destruction or unnecessary injury. The Federal Land Policy and Management Act of 1976 (FLPMA) directs BLM to periodically inventory the lands and to project present and future uses in land use plans. These plans are to ensure the management of public rangelands on a multiple-use and sustained yield basis and to ensure that the quality of natural resources is preserved.

To comply with these requirements, BLM's Phoenix District completed rangeland resource inventories for the Hualapai-Aquarius Planning Area in 1978 and 1979. The inventory method used for soils and vegetation is described in Appendix 1-1. The inventory revealed that rangeland condition throughout most of the planning area is well below potential. Specifically, 60 percent of the area is in fair condition or less, with an overall static trend. The inventories also revealed that demand for forage from competing users exceeds existing supply.

Present stocking levels for livestock in the planning area were determined in 1972 on the basis of historical licensed use. Rangeland inventory data did not exist for this adjudication process, nor was vegetation specifically allocated to wildlife, burros, or nonconsumptive uses.

To resolve these shortcomings, BLM developed a land use plan (management framework plan) in late 1979 and 1980. The plan includes proposals for a grazing management program that would adjust grazing levels in the planning area to the estimated carrying capacity. The program proposes the development of grazing treatments by allotment, the construction of rangeland developments, and the allocation of vegetation to livestock, wildlife, wild burros, and nonconsumptive uses.

The overall objective of the proposal is to improve the productivity of the public rangelands over a 20-year period and thereby serve a wide range of natural, social, economic, and environmental needs. The following list presents specific objectives for the EIS area.[2]

1. Improve rangeland condition on 856,749 acres of public lands over a 20-year period as follows:

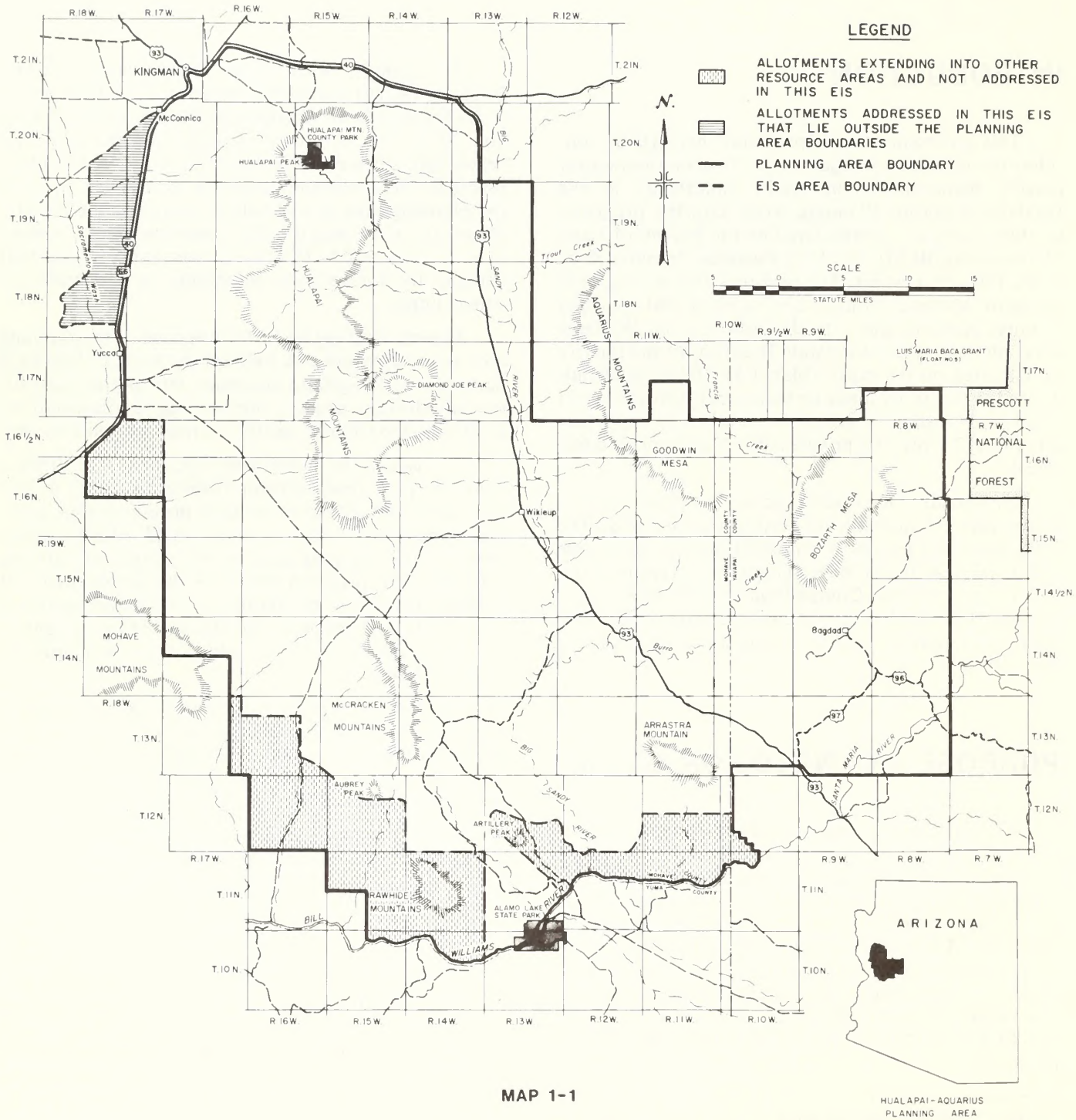
Condition Class	Present Acres	Future Acres
Excellent	20,724 (2%)	247,279 (29%)
Good	280,791 (33%)	415,407 (48%)
Fair	466,231 (55%)	142,340 (17%)
Poor	89,003 (10%)	51,723 (6%)

2. Reduce soil erosion, minimize sedimentation, and increase infiltration and productivity of rangeland soils. In particular, reduce soil erosion over the next 20 years on 106,907 acres of public lands having a moderate or higher erosion condition.
3. Improve water quality in the Burro Creek and Big Sandy watersheds and provide for recognized uses, including aquatic habitat.

[1] Acreage by surface ownership within the entire planning area is as follows: 1,006,436 acres of public lands, 95,821 acres of State trust lands, and 373,731 acres of private lands. Six grazing allotments, however, extend into other planning areas and are not addressed in this EIS. The allotments will be analyzed as whole units in future EISs. Grazing management decisions for these units will be delayed until the additional studies are completed (see Plate 1 for allotment boundaries).

[2] These objectives are taken from BLM's draft *Managing the Public Rangelands* (BLM, 1979a) and from the Hualapai-Aquarius MFP.

HUALAPAI – AQUARIUS PLANNING / EIS AREA



MAP 1-1

4. In 20 years increase forage available for consumptive uses by 36 percent on public rangelands from 43,665 AUMs to 59,339 AUMs.
5. Ensure long-term stability of livestock operators dependent on public rangelands in the EIS area.
6. Maintain viable herds of wild burros in designated herd management areas by ensuring adequate forage and protecting wild burro habitat.
7. Improve and protect fish and wildlife habitat on public lands to ensure stability and natural diversity of species. Within 20 years the EIS area should have suitable habitat and forage to support at least 3,384 mule deer, 95 pronghorn antelope, 26 elk, 30 bighorn sheep, and 1,214 javelina.
8. Improve and protect riparian communities on public lands along Burro Creek, the Big Sandy River, the Bill Williams River, and their tributaries. Within 20 years stabilize downward trends and improve overall rangeland condition in these communities.
9. Preserve and improve protected plant and animal species and their habitats including State-listed species, BLM sensitive species, and species proposed for or officially listed as having threatened or endangered status under Federal law.
10. Protect areas of special natural, scenic, historical, cultural, and scientific value.

This EIS assesses the environmental consequences of implementing the proposed grazing management program and alternatives for reaching rangeland management objectives for the Hualapai-Aquarius EIS Area. This EIS also responds to the amended 1974 court settlement initiated by the Natural Resources Defense Council, Inc., in which BLM was directed to prepare 144 grazing EISs for public rangelands in the western United States.

HUALAPAI-AQUARIUS LAND USE PLAN

PLANNING AND DECISIONMAKING PROCESS

The proposed grazing management program was developed as part of the Hualapai-Aquarius Land Use Plan. The following narrative describes the overall planning process as it has occurred to date. It also identifies the steps to be taken by BLM managers in making grazing management decisions for the planning area.

Resource Inventories

Between 1978 and early 1980, Phoenix District resource specialists conducted inventories and assembled information on nine basic resource categories in the planning area. The categories included Lands, Minerals, Forest Products, Rangeland Management, Watershed, Wildlife Habitat, Recreation, Wilderness, and Cultural Resources. The inventories involved field studies, literature searches, and consultation with agencies, organizations, and individuals. This information provided the data base for developing the land use plan.

Unit Resource Analysis

From July through December 1979, District staff prepared unit resource analyses (URAs) for the Hualapai and Aquarius Planning Units (BLM, 1979a;b). The URAs consist of four sections, including a base map, a physical profile of the unit, a description of the present situation of each of the nine resource categories, and management opportunities for each category. The District conducted workshops in December 1979, during which selected members of the public helped develop management opportunities.

Social-Economic Analysis

BLM specialists compiled social, economic, and demographic information into a social-economic profile (SEP) for the Lower Colorado region (BLM, 1979d). This information was used to prepare a planning area analysis (PAA) in January 1980 for the Hualapai-Aquarius Planning Area (BLM, 1980c). The PAA analyzes social, economic, environmental, and institutional values.

Management Framework Plan

In its final form, the management framework plan (MFP) is BLM's land use plan for a particular area. Its preparation involves three phases.

From January through April 1980, District resource specialists developed Step 1 of the MFP, which includes objectives and specific recommendations for each of the nine resource categories. Workshops in January provided an opportunity for other agencies, organizations, and individuals to participate in this phase.

Step 2 began in April 1980 with a second round of workshops to encourage broader public involvement in resolving conflicts between resource recommendations.

The manager of the Kingman Resource Area then drafted multiple-use management recommendations, which considered public comments and social, economic, and environmental factors in resolving Step I conflicts. During this phase, recommendations were completed for allocating vegetation to competing uses. The recommendations were prepared using the computer vegetation allocation model developed at the BLM's Denver Service Center (see Appendix 1-2).

A series of public meetings and open houses in June 1980 encouraged public involvement in the review and analysis of management recommendations. The meetings helped summarize significant issues identified during the planning process and generated public comments on potential alternatives to be addressed in the grazing EIS. By so doing, the meetings helped BLM meet requirements for a public scoping process set forth in the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act. See Appendix 1-3 for details of the scoping process. Management recommendations were completed shortly thereafter, taking into consideration public comments. (See Table 1-1.)

Completion of Step 3 of the MFP occurs when the Phoenix District Manager makes a decision on the multiple–use recommendations. This decision constitutes the land use plan. Decisions on rangeland management recommendations will be made no sooner than 30 days after the grazing EIS is completed.

Environmental Assessment

An interdisciplinary team of resource specialists analyzed the environmental consequences of the MFP Step 2 grazing management recommendations and compared them to the consequences of reasonable alternatives. This EIS documents the analysis and comparisons.

No sooner than 30 days after filing the final EIS with the Environmental Protection Agency, the BLM Phoenix District Manager will select one of the alternatives or a combination of alternatives as the grazing management program for the planning area. In making this selection, the District Manager will consider rangeland inventory analysis, multiple-use planning objectives, environmental impacts, economic effects, benefit-cost studies, and public comments. The District Manager will document his selection and the rationale leading to it in a rangeland management program document for the planning area. The document will be distributed to the interested public.

ISSUES IDENTIFIED

During the preparation of the land use plan, the following significant issues were identified that warranted detailed analysis in the EIS.

1. Range condition throughout most of the planning area is well below potential. Sixty percent is in fair condition or less, with an overall static trend.
2. Demand for vegetation from competing resources exceeds available supply. BLM must allocate vegetation to accommodate livestock, wild burros, wildlife, and nonconsumptive uses.
3. The following adverse social and economic impacts to livestock operators may occur from proposed grazing reductions:
   a. Loss of rancher income from decreased livestock sales.
   b. Lowered ranch market values due to decreased grazing preference on public range.
   c. Loss of operator confidence in Federal administration of public lands.
4. Important riparian habitats within the planning area are suffering adverse impacts from grazing animals.
5. Construction of rangeland developments and expansion of livestock grazing into areas previously receiving little or no grazing use may generate adverse impacts on wildlife resources and natural ecosystems.

Through scoping, BLM determined that the following issues also warrant analysis in the EIS. Because related impacts are not expected to be as significant as those listed above, the analysis will be correspondingly brief.

1. Impacts to water quality
2. Soil compaction and erosion
3. Impacts to cultural resources
4. Recreation impacts
5. Visual resource impacts
6. Impacts of rangeland program on wilderness values
7. Impacts to protected or sensitive plant and animal species
8. Social-economic impacts to communities and surrounding region

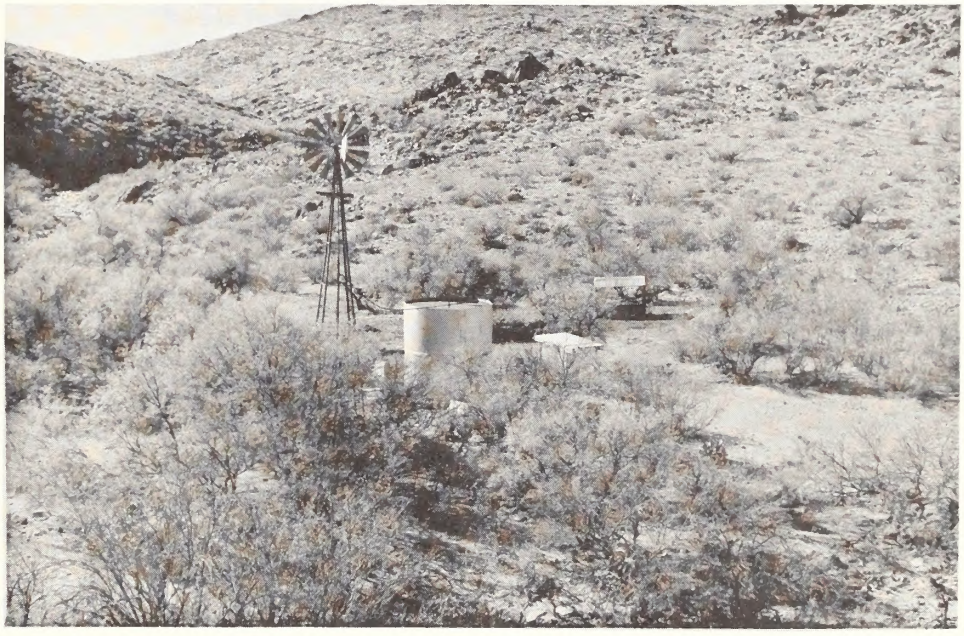
Through the scoping process, BLM determined that impacts to the following resources would be negligible or nonexistent and that analysis would be dropped altogether. Descriptions of these resources will be included to the extent they are necessary to develop complete analysis of impacts to other affected resources.

1. Climate
2. Topography
3. Geology and minerals
4. Air quality
5. Urban land uses

ALTERNATIVES SELECTED

Identification of issues during the planning and scoping process contributed to the selection of five alternatives for rangeland management including the proposed action. By providing a range of use levels between no action and no grazing, the alternatives allow for a useful and effective comparison of impacts. They also establish a wide range of options from which BLM managers can make a decision. The following alternatives have been selected for analysis in this EIS:

1. *Proposed Grazing Management Program (Proposed Action)*
2. *Continuation of Present Grazing Management (No Action)*
3. *Moderate Grazing Management*
4. *Wildlife Enhancement*
5. *Elimination of Livestock Grazing*



Water Is Important on Desert Rangelands

Water is critical to proper management of livestock operations and for many wildlife species on southwest desert rangelands. Substantial numbers of water developments are proposed by all alternatives except the elimination of livestock grazing on public lands. The typical water development pictured above includes a windmill, storage tank, and water troughs.

TABLE 1-1
MFP RECOMMENDATIONS

MFP-1 Recommendations	Conflicting MFP-1 Recommendations	Multiple-Use (MFP-2) Recommendations	Resource Trade-Offs
Rangeland Management	Wildlife	Apply intensive grazing management (AMPs) to 28 allotments to improve rangeland condition and to increase forage production for livestock, wildlife, and burros. Livestock grazing may be eliminated if the intensive management does not sufficiently improve riparian, aquatic and other important habitats.	Areas with critical wildlife habitat would continue to be grazed in line with the current forage production.
1. Implement intensive grazing systems on 28 allotments in the H/A EIS area.			
1a. Provide a full year's rest and deferment during the critical growing season of the key forage plants.	1a. Eliminate or protect from livestock grazing, critical wildlife habitat (including riparian and aquatic habitat) by fencing. Areas to be fenced include Burro Creek allotment and SHSs.	Develop allotment management plans (AMPs), habitat management plans (HMPs), and herd management area plans (HMAPS) in concert to specify the actions necessary for the improvement and protection of wildlife habitat, desert bighorn sheep lambing grounds, and riparian and aquatic habitat for threatened, endangered, State-listed, and sensitive plants and animal species.	
1b. Limit utilization to 50 percent of the current year's growth of key forage plants during each grazing cycle.	1b. Protect and improve habitat for 20 threatened, endangered, State-listed or sensitive animal species by restricting several multiple-use activities on public lands. Limit utilization to 40 percent of the current year's growth of perennial species. Rangeland development work would be limited, and livestock and wild burro grazing would be eliminated from bighorn lambing areas.	Monitor or prohibit the construction of rangeland developments or other habitat disturbing impacts on the crucial use, conflict, or habitat improvement areas for the 20 listed species.	Livestock stocking on all allotments would be based on proposed forage allocations. Livestock and burro grazing would continue on desert bighorn lambing areas.
		Utilization will generally range between 40 percent and 60 percent of the current year's growth on key forage species and should never exceed 60 percent.	
	Burros		
	1c. Establish two wild burro parks for the exclusive use of burros.	Designate two herd areas. Continue livestock grazing and develop HMAPs, along with HMPs and AMPs, each of which would be designed to resolve site-specific problems.	Livestock grazing would continue in herd areas on the basis of the desired number of burros.
2. Designate and manage 4 allotments for ephemeral grazing only.	2a. Same as 1a above.	By 1982, designate and manage four allotments for ephemeral use only.	Areas with critical wildlife and other important habitat would continue to be grazed in line with current forage production.
	2b. Same as 1b above.		When climatic conditions are favorable for the growth of large amounts of ephemeral forage, livestock would graze the crucial use, conflict, or habitat improvement areas.
3. Apply less intensive management to four allotments.	3a. Same as 1a above.	Apply less intensive management to four allotments. Less intensive management would not involve a grazing system but would establish numbers and kind of livestock, period of use, and rangeland developments. AMPs may be prepared at a later date to enhance multiple-use management.	Areas with critical wildlife habitat would continue to be grazed in line with the current forage production.
	3b. Same as 1b above.		Livestock stocking on all allotments would be based on proposed forage allocations.
4. Apply nonintensive management to 15 allotments.	None	Apply nonintensive grazing management to 15 allotments. These allotments would not require AMPs, but BLM would monitor condition, trend, and utilization through scheduled visits.	None

TABLE 1-1 (Continued)
MFP RECOMMENDATIONS

MFP-1 Recommendations	Conflicting MFP-1 Recommendations	Multiple-Use (MFP-2) Recommendations	Resource Trade-Offs
5. Allocate 38,008 AUMs (3,167 cattle yearlong) of forage to livestock in accordance with 1978/79 rangeland inventory.	Burros Allocate 2,898 AUMs (483 burros) of forage to wild burros. Wildlife Allocate 12,212 AUMs of usable forage to big game to accommodate the following numbers of animals. Mule Deer 3,384 Antelope 95 Elk 26 Desert Bighorn 30 Javelina 1,214	Allocate forage first to existing numbers of big game and desired number of burros before allocating the remainder to livestock. AUMs / Animals Livestock 34,242 / 2,853 Burros 834 / 139 Big Game 8,589 / — Mule Deer — / 2,687 Antelope — / 81 Elk — / 16 Bighorn Sheep — / 19 Javelina — / 154	Allocated livestock forage would be reduced by 3,766 AUMs (314 cattle) to accommodate big game and wild burros. Allocated wild burro forage would be reduced by 2,064 AUMs (344 burros) from MFP-1 recommendations. Allocated big-game forage would be reduced by 3,623 AUMs from MFP-1 recommendations. The following numbers of animals would be affected by the reduced allocation: Mule Deer 1,677 Antelope 14 Elk 10 Bighorn Sheep 11 Javelina 1,060
6. On a small scale, test and evaluate prescribed burns and land treatments in the chaparral for potential rangeland benefits.	None	Same as MFP-1.	Erosion would cause a short-term loss of soil, but watershed quality would eventually improve.
7. In conjunction with AMP implementation, initiate rangeland monitoring studies (utilization, actual use, condition, trend, phenology, precipitation, and fecal analysis) to provide specific onsite data on vegetation, soils, and climate.	None	Same as MFP-1	None
8. Acquire approximately 43 sections of private and uncontrolled land in Happy Jack Wash and Francis Creek allotments, which represent a large percentage of these two allotments.	None	Same as MFP-1. Acquiring private and uncontrolled land would facilitate multiple-resource management. This acquisition would allow for intensive management and increased stocking rates, since uncontrolled lands are not included in the allocation process.	None
9. Dispose of 22,312 acres in 15 allotments containing small amounts of uncontiguous public land. Possibilities are numerous for exchanging these scattered tracts for tracts that would block up public land in other areas.	Some of this land may have high wildlife, watershed, botanical, mineral, recreational, or cultural values.	Same as MFP-1. Exchange 22,632 acres of public land for land that would block up public land with greater resources elsewhere. Livestock grazing management is also not feasible on these scattered tracts of land. Retain and protect any land with significant wildlife, watershed, mineral, recreational, or cultural values.	Unidentified resources may be transferred out of Federal ownership, but important resources may be acquired, providing better opportunities to manage for multiple-use benefits.

CHAPTER 2
ALTERNATIVES INCLUDING THE PROPOSED ACTION

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CHAPTER 2

ALTERNATIVES INCLUDING THE PROPOSED ACTION

INTRODUCTION

Chapter 2 describes in detail the five alternatives selected for study, including the proposed action. The description allows the reader to compare the merits of the alternatives and to conclude how well each achieves management objectives for the Hualapai-Aquarius Planning Area. Chapter 2 concludes with a comparative summary of the impacts of the alternatives to provide the public and the decisionmaker with a convenient tool for defining issues and reaching conclusions.

Each alternative is described by five components, where applicable:

1. *vegetation allocation* — a summary of the animal unit months (AUMs) or pounds of vegetation to be allocated to livestock grazing and other resources and adjustments required from current levels of livestock grazing;

2. *levels of grazing management* — a description of the levels of grazing management proposed for each allotment and reasons for the selection of these levels;

3. *rangeland developments* — a summary of new developments needed for effective rangeland management under each alternative;

4. *implementation* — identification of sequences and timeframes for implementing the components of each alternative;

5. *monitoring and administration* — a summary of the various studies needed to evaluate how well each alternative is meeting objectives for rangeland management and to determine if vegetation allocations should be adjusted.

For brevity's sake, components of the proposed action that apply to other alternatives will not be described in later sections. Moreover, measures for resource protection and enhancement that would be applied under all alternatives are listed in one section near the end of the chapter.

DESCRIPTION OF ALTERNATIVES INCLUDING THE PROPOSED ACTION

PROPOSED GRAZING MANAGEMENT PROGRAM (PROPOSED ACTION)

The proposed grazing management program corresponds to recommendations for rangeland management in Step 2 of the Hualapai-Aquarius Management Framework Plan (MFP) and constitutes BLM's preferred alternative. The proposal includes other resource recommendations where they relate directly to grazing management and where necessary to meet broad rangeland objectives.

Basically, the proposal would rely heavily on adjustments in livestock and wild burro numbers and on the development of intensive grazing systems to achieve long-term increases in plant vigor and vegetation production. Considerable investment would be made in rangeland developments to implement the grazing systems, control livestock movement, and achieve better distribution of livestock grazing. The proposal would generally benefit wildlife habitat, burro habitat, water quality, watershed, and recreation.

Vegetation Allocation

Initial allocations of vegetation are proposed for livestock, wild burros, and big game (mule deer, antelope, bighorn sheep, javelina, and elk). The allocations are designed to achieve an average utilization of 50 percent of the annual production of key forage species during each grazing cycle or during a 3-year period on allotments not having grazing systems. This average would be achieved by varying utilization of key species between 40 and 60 percent.

Utilization at this level is intended to improve species composition (Rivers and Martin, 1980), increase herbage production (Van Poollen and Lacey, 1979), and allow for recovery and improvement of public rangelands in the EIS area. Allocations would have to be periodically adjusted to reflect changes in forage production.

The allocations to livestock, wild burros, and big game are made in animal unit months (AUMs). One AUM is defined as 800 pounds of forage (air dry weight) or the amount of vegetation necessary to sustain one cow or its equivalent for 1 month. For this analysis, 1

AUM will support four deer, five bighorn sheep, eight javelina, two burros, five antelope, or one elk. The remaining vegetation (defined in total pounds air dry weight) would be allocated for plant maintenance, soil and watershed protection, recreation values, and small-game and nongame food and cover. This alternative proposes no changes in kind of livestock.

The proposal would allocate 34,242 AUMs (27,393,600 pounds) for livestock, a reduction of 54 percent from the authorized grazing preference of 74,417 AUMs on public lands and a reduction of 39 percent from the 5-year averaged licensed use of 55,696 AUMs. Adjustments in grazing preference would vary by allotment from an increase of 20 percent to a reduction of 100 percent.[1] The livestock grazing summary for the proposed action and four alternatives is shown in Table 2-1. Descriptions by allotment are provided in Appendix 2-1. Big game would be allocated 8,589 AUMs (6,871,200 pounds), forage adequate to sustain existing big-game populations (AG&FD and BLM estimates). In accordance with MFP Step 2 recommendations, BLM would reduce wild burro populations from present numbers to maintain an average of 139 animals within the EIS area. On the basis of this figure, burros would be allocated 834 AUMs (667,200 pounds). The remaining 406,551,783 pounds of vegetation[2] would be allocated to other resources: small game and nongame species, wildlife cover, watershed protection, recreation, and plant maintenance.

An estimated 59,387 AUMs (47,509,600 pounds) of forage would be available for allocation 20 years after implementation. Tentative, projected allocations amount to 46,164 AUMs (36,932,000 pounds) to livestock, 12,388 AUMs (9,910,400 pounds) to big game, and 834 AUMs (667,200 pounds) to burros. A total of 412,820,483 pounds of vegetation would remain for allocation to other resources. As vegetation production increases, it would be allocated according to planning objectives and the needs of each resource.

Estimated future production is based on making more vegetation accessible to livestock by developing waters in areas more than 3 miles from existing waters and by increasing usable forage production through intensive grazing management.

Initial and projected allocations are summarized for each alternative in Table 2-2. Appendices 2-3 and 2-4 show initial and projected allocations for the proposed action by allotment.

[1] A 100 percent reduction would occur on two allotments proposed for ephemeral designation, where livestock grazing would be authorized only when adequate ephemeral vegetation is predicted to occur. Grazing preference would also be eliminated on 330 acres of public lands in the JJJ allotment because of its unsuitability for grazing. Livestock grazing is expected to continue on the non-Federal lands within the allotment.

[2] Pounds of vegetation are used to define allocation to other resources because most of this vegetation is not forage. AUMs would be a misleading and inappropriate measure.

TABLE 2-1
LIVESTOCK GRAZING SUMMARY

			Authorized Grazing Preference	Average Licensed Use[1] (1975-1980)	Proposed Action	No Action	Moderate Management	Wildlife Enhancement	Eliminate Livestock
Public Range	Initial Allocation AUMs		74,417	55,696	34,242	74,417	30,819	27,272	0
	Percent Change	From Grazing Preference	N/A	N/A	-54	0	-59	-63	-100
		From Average License[1]	N/A	N/A	-39	NA	-45	-51	-100
Public plus Controlled Range	Initial Allocation AUMs		111,742	84,677	52,711	111,742	47,443	42,086	NA
	Percent Change[2]	From Grazing Preference	N/A	N/A	-53	0	-58	-62	NA
		From Average License	N/A	N/A	-38	NA	-44	-50	NA

[1] Average licensed use does not include ephemeral licenses or unauthorized use.
[2] An exact comparison to the present situation is not possible because of changes in the basis for comparison on many allotments.

TABLE 2-2
VEGETATION ALLOCATION SUMMARY[1]

			Proposed Action	No Action	Moderate Management	Wildlife Enhancement	Eliminate Livestock
Initial	Vegetation (lbs)		441,483,783	441,483,783	441,483,783	441,483,783	441,483,783
Production	Usable Forage (lbs)[2]		99,242,065	99,242,065	99,242,065	99,242,065	99,242,065
Projected[3]	Vegetation (lbs)		460,330,083	431,689,986	451,635,688	460,330,083	448,837,914
Production	Usable Forage (lbs)[2]		118,088,365	89,448,268	109,393,171	118,088,365	106,596,196
Livestock Allocation	Initial	lbs	27,393,600	59,533,600	24,655,200	21,817,600	0
		AUMs	34,242	74,417	30,819	27,272	0
	Projected	lbs	36,932,000	59,533,600	29,316,800	29,814,702	0
		AUMs	46,165	74,417	36,649	37,268	0
Big-Game Allocation	Initial	lbs	6,871,200	0	6,871,200	9,769,600	6,871,200
		AUMs	8,589	0	8,589	12,212	8,589
	Projected	lbs	9,910,400	0	9,769,600	11,661,480	9,769,600
		AUMs	12,388	0	12,212	14,577	12,212
Burro Allocation	Initial	lbs	667,200	0	667,200	667,200	2,318,400
		AUMs	834	0	834	834	2,898
	Projected	lbs	667,200	0	667,200	667,200	2,318,400
		AUMs	834	0	834	834	2,898
Other Resources	Initial	lbs	406,551,783	381,950,183	409,290,183	409,229,383	432,294,183
	Projected	lbs	412,820,483	372,156,386	411,882,088	418,186,701	436,749,914

1 All figures are for public land only.
2 Usable forage equals total forage production multiplied by an allowable use factor (AUF) and includes forage which is unsuitable for livestock because of inaccessibility or dietary limitations.
3 All projections are for 20 years after implementation.

Levels of Grazing Management

The proposed action recommends four levels of grazing management: intensive grazing, less intensive grazing, nonintensive grazing, and ephemeral grazing. Designations are also proposed by allotment for perennial or perennial-ephemeral grazing. Specific recommendations are summarized in Table 2-3. Six allotments (Boriana, Cane Spring Wash, Kent's Cane Spring, Lazy YU, Sandy, and Yellow Pine) would be split into units "A" and "B" to allow different levels of management on each unit.

TABLE 2-3
PROPOSED GRAZING MANAGEMENT SUMMARY

Intensive Management (28 Allotments-776,690 Public Acres)

Cool-and Warm-Season Deferment/Rest

Perennial-Ephemeral		Perennial Only	
Arrastra Mountain		Kent's Cane Spring	'A'
Bagdad		Hualapai Peak	
Big Sandy		Yellow Pine	'A'
Black Mesa		McElhaney	
Boriana	'A'		
Chicken Springs			
Diamond Joe			
Francis Creek			
Happy Jack Wash			
La Cienega			
Lazy YU	'A'		
Walnut Creek			

Warm-Season Deferment/Rest (All Perennial-Ephemeral)

Artillery Range	Greenwood Pk. Community
Bateman Springs	Groom Peak
Burro Creek	Los Molinos
Burro Creek Ranch	Wikieup
Gray Wash	Gibson
Greenwood Community	Lines

Less Intensive Management (4 Allotments-8,780 Public Acres) (All Perennial-Ephemeral)

Cane Springs Wash	'A'	Sandy	'A'
Hot Springs		Little Cane	

Nonintensive (15 Allotments-20,226 Public Acres) (All Perennial-Ephemeral)

Bottleneck Wash		Lazy YU	'B'
Byner		Round Valley	
Cane Springs Wash	'B'	Sandy	'B'
Fancher Mountain		Sweet Milk	
JJJ		Trout Creek	
Kayser Wash		White Springs	
Kellis		Yellow Pine	'B'
Kent's Cane Spring	'B'		

Ephemeral (4 Allotments-51,053 Public Acres)

Alamo Crossing		Chino Springs	
Boriana	'B'	D.O.R.	

Intensive Grazing

Intensive grazing management is proposed for 28 allotments, involving 776,690 acres of public lands, which produce 32,729 AUMs of livestock forage. Specific grazing systems would be developed for each allotment and described in an allotment management plan (AMP). The AMP would also identify numbers of livestock, kind of livestock, periods of use, and rangeland developments necessary to implement the grazing system. AMPs would be prepared during the 5-year period following the filing of the final EIS and after grazing decisions have become final. AMPs would be developed in cooperation with the livestock operator and other affected land owners. Appropriate government agencies, organizations, and interest groups would also be consulted. The AMPs would incorporate principles of multiple use and sustained yield as outlined in the Hualapai-Aquarius MFP.

Grazing systems developed under the proposed action would incorporate the following grazing treatments in various combinations:

- Require at least 1 year's rest out of 4 to permit increased key forage production by changing botanical composition, improving plant vigor, stimulating plant growth and reproduction (through seed dissemination and seedling establishment), and allowing litter to accumulate to protect the soil surface.

- Defer grazing 1 year out of 4 during the cool-season critical growth period (approximately April 15 to May 31) to allow key forage plants to increase in density, composition, vigor, and production. Table 2-4 shows species that would benefit from this treatment.

- Defer grazing 1 year out of 4 during the critical growth period for warm-season plants (approximately July 15 to September 30) to give the same benefits as the cool-season plants. Table 2-4 shows species that would benefit from this treatment.

- Adjust livestock numbers as necessary over time to achieve a 40 to 60 percent utilization of key forage species in grazed pastures.

Once AMPs are implemented, an estimated 20 years would be required to meet the AMP objectives for long-term sustained productivity of livestock forage and improvement in watershed and wildlife. This time would allow for several repetitions of the grazing cycle (alternate periods of grazing deferment and rest) on all allotments.

BLM would authorize ephemeral grazing on allotments designated perennial-ephemeral when a field evaluation determines that adequate ephemeral forage exists. Ephemeral grazing would not be authorized in pastures being rested or deferred from grazing.

Less Intensive Grazing

Four allotments have been proposed for less intensive grazing management on 8,780 acres of public lands, involving 187 AUMs of livestock forage. These allotments have solidly blocked public rangelands intermin-

gled with private and State lands and have a low forage production.

TABLE 2-4
KEY SPECIES BENEFITING FROM GRAZING TREATMENTS

Cool-Season Species	
Agropyron spicatum	Bluebunch wheatgrass
Koelaria pyrimidata	Junegrass
Oryzopsis hymenoides	Indian ricegrass
Poa fendleriana	Muttongrass
Sitanion hystrix	Squirreltail
Stipa speciosa	Desert Needlegrass
Tricachne californica	Cottontop

Warm-Season Species	
Bouteloua curtipendula	Sideoats grama
Bouteloua eriopoda	Black grama
Bouteloua gracilis	Blue grama
Bouteloua hirsuta	Hairy grama
Hilaria mutica	Tobosa
Hilaria rigida	Big galleta
Muhlenbergia porteri	Bush muhly
Sporobolus contractus	Spike dropseed
Sporobolus cryptandrus	Sand dropseed

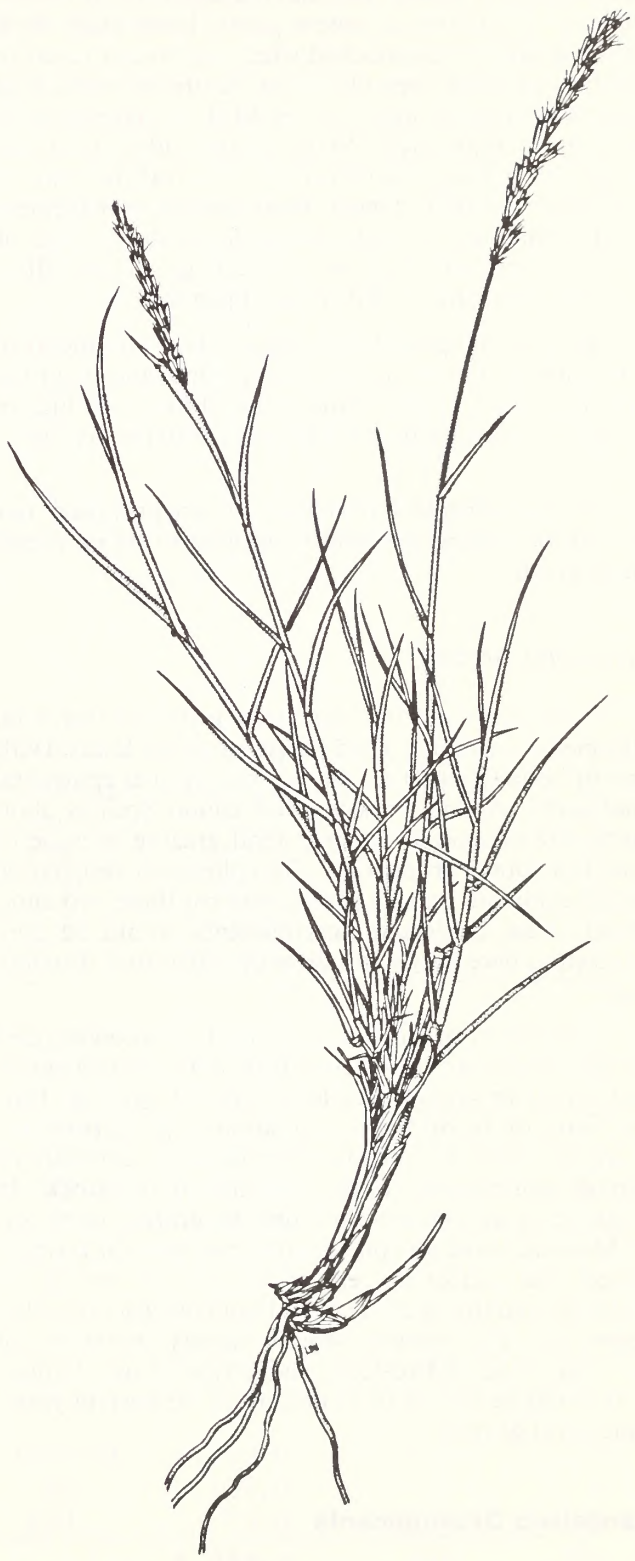
Less intensive grazing management would involve no intensive grazing systems but would establish numbers and kind of livestock, period of use, and rangeland developments necessary for proper resource management. It is recommended for allotments where projected benefits to multiple resources are not high enough to justify the cost of an intensive grazing system. AMPs, however, may be prepared where managers feel that multiple-use management would be enhanced.

BLM specialists would periodically inspect less intensive allotments to ensure that utilization of key forage plants does not exceed an average of 50 percent. Stocking levels would be adjusted as necessary to maintain this level of utilization.

Additional rangeland developments would be required to obtain better livestock distribution and control throughout the allotments. Existing rangeland developments would continue to be maintained.

Nonintensive Grazing

Nonintensive grazing is proposed for 15 allotments, involving 20,226 acres of public lands, which produce



Big Galleta

1,326 AUMs of livestock forage. Nonintensive management (formerly called custodial management) is recommended for allotments where public lands make up a small portion of the area and where significant resource conflicts have not been identified. Scattered public land ownership makes intensive Federal management of these units impractical. Many of the public lands involved have been recommended for transfer out of Federal ownership. Under nonintensive management BLM would specify only livestock numbers, kind of livestock, and period of use. The acreage of each allotment by ownership is shown in Appendix 2-4.

BLM would periodically inspect these allotments to determine resource conditions and compliance with the grazing permit. Public lands that show a decline in resource conditions may be fenced to stop the deterioration.

No new rangeland developments are proposed, but existing developments would continue to be used and maintained.

Ephemeral Grazing

Ephemeral grazing has been proposed for four allotments, involving 51,053 acres of public lands. DOR and Boriana (Unit B) are already managed as ephemeral allotments. Alamo Crossing and Chino Springs allotments are proposed for ephemeral grazing because of their low forage production. The ephemeral designation would eliminate grazing preferences for these two allotments. New rangeland developments would be constructed as necessary to attain proper livestock distribution.

Ephemeral grazing management is recommended for allotments not consistently producing enough perennial forage to support yearlong livestock grazing. During years of favorable precipitation and temperature, however, these allotments produce large amounts of annual (ephemeral) forage available to livestock. In response to an application from the grazing operator, BLM would issue an ephemeral license when it is determined that adequate ephemeral forage would be available and that grazing would not conflict with other resources. The license would specify numbers of livestock, kind of livestock, and period of use. Utilization would be limited to 50 percent of the current year's ephemeral growth.

Rangeland Developments

Construction

The following rangeland developments are expected to be needed to implement the proposed action: 22 catchments, 11 reservoirs, 106 spring developments, 19 wells, 112 miles of pipeline, 209 troughs, 266 miles of fence, 37 cattleguards, and 8 miles of stock trail. Initial construction costs would amount to $3,184,500, and annual maintenance costs would amount to $126,000. Specific proposals will be made upon completion of the AMPs.

Fences and water developments would be built to provide better distribution of livestock, control livestock movement, improve use of key forage plants, and protect riparian habitats. New water developments would also enable some wildlife to improve their distribution. BLM-proposed developments may be built by BLM work crews or constructed by private firms under government contract. In addition livestock operators may be authorized to construct other developments at their own expense.

Sites for rangeland developments have not been selected, since AMPs have not been prepared. BLM would prepare environmental assessments (EAs) on specific developments before their approval to ensure that all resources are adequately considered. Table 2-5 summarizes the number and kinds of developments proposed for each alternative. Appendix 2-5 shows proposed rangeland developments by allotment for the proposed action.

Rangeland developments on public lands would be authorized by one of two methods: (1) range improvement permit or (2) cooperative agreement.

A range improvement permit authorizes a privately owned project (such as a corral) that aids the livestock operator in the handling of livestock. BLM authorizes these permits when the permittee is willing to pay all expenses. These developments, however, must meet the same environmental and engineering standards as those constructed by BLM.

Under cooperative agreements, BLM funds part or all of the development, and title goes to the United States. Cooperative agreements must specify the maintenance responsibility and division of cost and labor between BLM and the permittee.

The MFP proposes no major land treatments or vegetation manipulations for the EIS area. It does, however, recommend experimental, small-scale, prescribed burns and land treatments in oak brush-ceanothus chaparral to evaluate the potential for increased rangeland productivity from such treatments. Specific treatments and locations have not yet been selected. Once proposals are developed and sites chosen, however, an environmental assessment (EA) would be written to identify potential impacts and mitigation.

Maintenance

Permittees maintain all rangeland developments authorized under range improvement permits and nor-

TABLE 2-5
RANGELAND DEVELOPMENT SUMMARY[1]

Alternative	Development Type	Units	Cost $(000) (1981)	Acres Disturbed Short Term	Acres Disturbed Long Term
Proposed Action	Catchment	22	440.0	33	26
	Reservoir	11	60.5	22	18
	Spring	106	106.0	27	9
	Well (equipped)	19	247.0	5	1
	Pipeline	112 mi	952.0	112	37
	Trough	209	57.5	105	105
	Fence	266 mi	1,197.0	133	27
	Cattleguard	37	116.5	4	4
	Stock Trail	8 mi	8.0	8	1
	TOTALS		3,184.5	449	228
Continuation of Present Management (No Action) and Moderate Grazing Management	Catchment	13	260.0	20	16
	Reservoir	7	38.5	14	11
	Spring	56	56.0	14	5
	Well (equipped)	9	117.0	2	1
	Pipeline	36 mi	306.0	36	12
	Trough	103	28.3	52	52
	Fence	129 mi	580.5	65	13
	Cattleguard	13	41.0	1	1
	Stock Trail	0	0	0	0
	TOTALS		1,427.3	204	111
Wildlife Enhancement	Catchment	21	420.0	32	25
	Reservoir	6	33.0	12	10
	Spring	104	104.0	26	9
	Well (equipped)	12	156.0	3	1
	Pipeline	83 mi	705.5	83	28
	Trough	184	50.6	92	92
	Fence	279 mi	1,255.5	140	28
	Cattleguard	37	116.6	4	4
	Stock Trail	0	0	0	0
	TOTALS		2,841.2	392	197
Elimination of Livestock Grazing	Fence	1500 mi	6,750.0	750	150
	Cattleguard	60	189.0	6	6
	Gates	100	10.0	0	0
	TOTALS		6,949.0	756	156

[1] Developments proposed for each allotment by alternative are presented in Appendix 2-5.

mally maintain fences, springs, wells, and pipelines authorized under cooperative agreements. Under cooperative agreements, BLM normally reconstructs major rangeland developments and maintains reservoirs, catchments, and multiple-use projects such as wildlife guzzlers.

Implementation

Following the filing of the final EIS and development of the rangeland management program document, AMPs would be developed for all allotments undergoing intensive grazing management. BLM would prepare AMPs in cooperation with the livestock operator and other affected land owners. Appropriate government agencies, organizations, and interest groups would also be consulted.

A herd management area plan (HMAP) would also be prepared to outline details of a burro capture plan, adoption program, and the long-term management of wild burro populations in the EIS area. The capture plan would be prepared in consultation with special interest groups, government agencies, and affected livestock operators and would be analyzed in a site-specific EA.

Intensive grazing management proposals would be implemented within 5 years after grazing decisions have become final and as funds become available. The priority for implementing AMPs is shown in Table 2-6. Criteria for determining priorities include soil and vegetation condition, rate of recovery, benefit-cost ratios, conflicts with other resources, and rangeland developments needed for implementation.

Livestock numbers would be adjusted within the first grazing year following completion of the EIS and preparation of the rangeland management program document. Where a reduction occurs, the difference between the current active preference and the proposed allocation would be suspended. Suspended grazing preference would not be reauthorized until forage is permanently available and allocated for livestock grazing. When consistent with resource management goals, adjustments may be scheduled over a 3-year period when they otherwise would create unusual economic hardship on the permittee.

Removal of excess wild burros would begin upon approval of the HMAP.

Range trend and utilization studies would be initiated on all allotments at various times during implementation. Water developments and fences would then be constructed, after which grazing systems would be implemented.

The proposed action's goal is to attain specific management objectives within 20 years of implementation.

TABLE 2-6
AMP IMPLEMENTATION PRIORITY

Year of Implementation[1]	Allotments	
1	Yellow Pine	'A'
	Walnut Creek	
	Gray Wash	
	Greenwood Pk. Community	
	Burro Creek	
	Burro Creek Ranch	
2	Lines	
	Bateman Spring	
	Chicken Spring	
	Arrastra Mountain	
	Hualapai Peak	
	Black Mesa	
3	La Cienega	
	Diamond Joe	
	Artillery Range	
	Gibson	
	Big Sandy	
	Greenwood Community	
4	Los Molinos	
	Groom Peak	
	Wikieup	
	Lazy YU	'A'
	Boriana	'A'
	Happy Jack Wash	
5	Kent's Cane Spring	'A'
	Bagdad	
	McElhaney	
	Francis Creek	

[1]Utilization and trend studies would be initiated on all allotments in the first year.

Monitoring Program

BLM would monitor AMPs to determine how well specific objectives are being met. Actual use, utilization, trend, climate, and wildlife studies would be initiated on allotments after the filing of the final EIS and would play a major role in determining future stocking rates.

At the end of the grazing period, the permittee would report the actual use to BLM, including exact periods of use and numbers of livestock grazed in each pasture. In addition, at the end of each grazing period BLM would determine the utilization of key forage plants (including browse) on key areas. Together these data would be used to extrapolate the amount of vegetation actually available as forage for livestock, wildlife, and wild burros.

Trend data would be collected at regular intervals by use of transects and photographs. Trend studies show changes in vegetation and soil over time.

BLM would install rain gauges throughout the EIS area to record yearly changes in precipitation. Such information is important because fluctuations in precipitation may significantly affect vegetation production and plant vigor and bias trend in vegetation condition.

Studies would also be conducted to ensure that management objectives for wildlife habitat are being met. BLM would monitor wildlife habitat conditions using exclosures, browse utilization and plant cover transects, and trend photography. Arizona Game and Fish Department (AG&FD) data would be used to determine game population trends.

At the end of each grazing cycle BLM would evaluate the AMP to determine if it is meeting its objectives. Using data from previously described studies, specialists would determine the need for changing the AMP. Such changes might include altering the grazing system, adjusting livestock numbers or periods of use, or adding rangeland developments. The following example shows how study data are used in calculating stocking rate adjustments.

	Allotment A	Allotment B
Climate	Normal precipitation	Normal precipitation
Trend	Cover down 5% Key Species down 5%	Cover up 10% Key species up 5%
Utilization	80%	35%
Actual Use	600 AUMs/Year	400 AUMs/Year

Allotment A shows a downward trend, indicating that numbers must be adjusted to reduce utilization. Following is the formula (BLM Manual 4413.3) used to calculate the adjusted stocking rate necessary to achieve a desired level of utilization:

$$\frac{600 \text{ AUMs}}{80\%} = \frac{x}{50\%} \qquad x = 375 \text{ AUMs}$$

Allotment B shows an upward trend, permitting an increase in stocking rate up to 50 percent utilization. The formula is used to determine the adjustment.

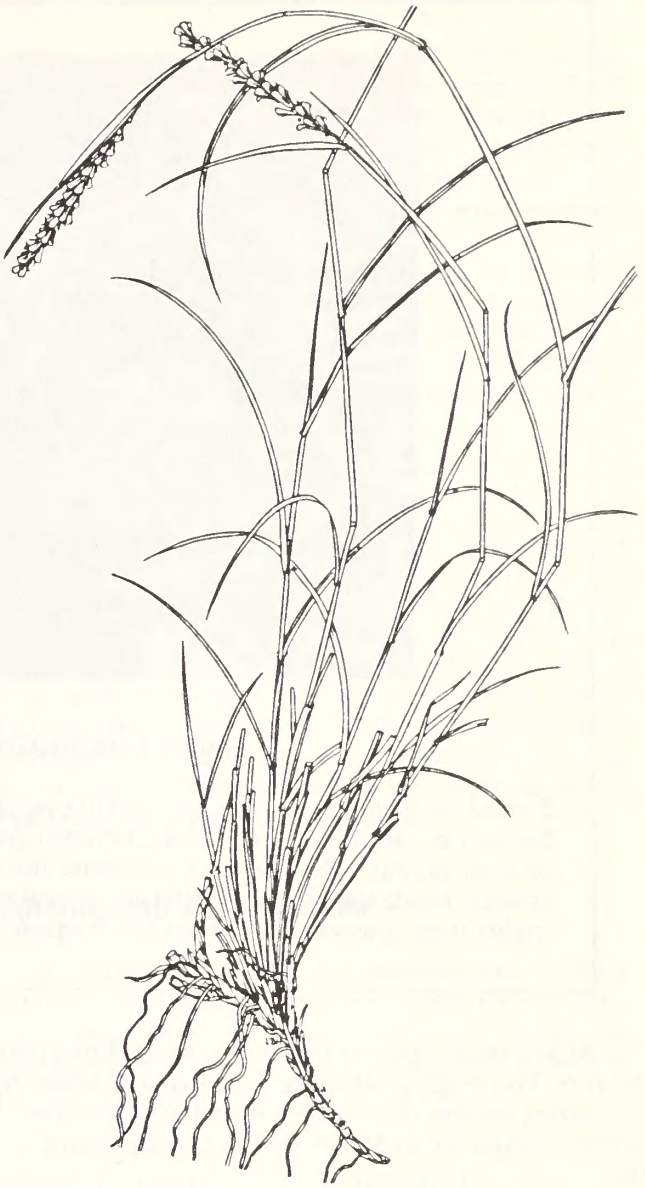
$$\frac{400 \text{ AUMs}}{35\%} = \frac{x}{50\%} \qquad x = 571 \text{ AUMs}$$

Allotments under less intensive, nonintensive, and ephemeral grazing would be evaluated periodically to determine changes in resource conditions. Should resource problems be identified, management or stocking rates would be adjusted to resolve the problems.

Fecal analysis may be used to assess conflicts of forage use between big game, livestock, and burros in crucial habitat areas. This analysis could result in changing grazing treatments and livestock or burro numbers.

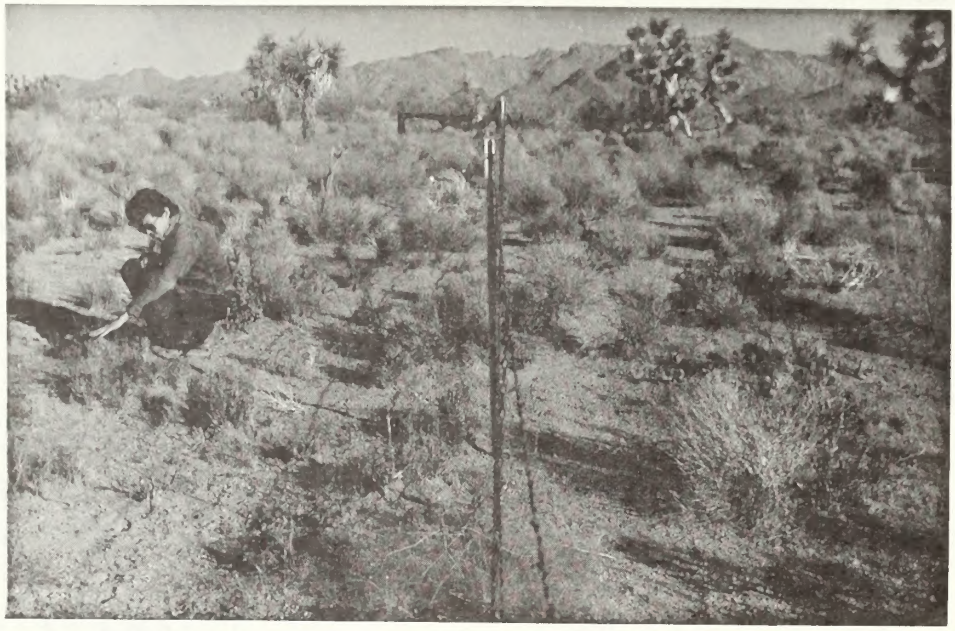
Administration

Each livestock operator is offered a 10-year permit, which specifies numbers and kind of livestock and period of use for each allotment. If an AMP is prepared, it would be included in the terms and conditions of the permit.



Tobosa

Each AMP would identify a given amount of flexibility in livestock numbers and movement dates that the permittee could exercise without prior BLM approval. This flexibility could allow the operator to move livestock on or off an allotment or pasture up to 2 weeks before or after the scheduled dates. It could also allow the permittee to vary the livestock numbers in each allotment or pasture as long as the total actual use does not exceed the proposed allocation levels shown in Appendix 2-2. Normal flexibility allows the operator to adjust to climatic fluctuations such as high or low production, availability of water, early or late rangeland readiness, and variations in ranching operations.



Studies Evaluate Grazing Impacts on Rangelands

Fenced rangeland exclosures are used to evaluate the success of past rangeland management practices. Exclosures can show the difference between grazed areas and those excluded from livestock, big game, or even rabbits. This livestock exclosure documents the effects of past livestock grazing on forage grasses. Inside the exclosure (left) are several big galleta and bush muhly plants. Outside the exclosure (right) these grasses occur much less frequently.

BLM would supervise livestock grazing throughout the year. To change grazing use from that authorized by the grazing permit, the operator would have to submit a written request to BLM before the grazing period begins.

Unauthorized livestock use of public rangelands would constitute trespass. Should trespass be discovered, BLM would have the unauthorized livestock removed and require that responsible operators pay for forage consumed and damages incurred. Ear tags may be used to help detect trespass in certain areas.

Changes to the proposed authorized use (including change in kind of livestock) would require preparation of an EA. In addition, BLM would adjust the rangeland management program as necessary during drought or other emergencies. Such adjustments would be designed to accomplish rangeland management objectives.

Work Force Requirements

To implement the proposed action, an estimated 100 workmonths per year would be required in addition to fiscal year 1981 funding levels. Administration, monitoring, and studies would require approximately 45 additional workmonths per year after implementation.

CONTINUATION OF PRESENT GRAZING MANAGEMENT (NO ACTION)

The no-action alternative is addressed in accordance with Council on Environmental Quality regulations (40 CFR 1500). The analysis will document the impacts to rangeland resources of BLM's taking no action to change existing rangeland management.

Vegetation Allocation

Under continuation of present grazing management, authorized livestock use would remain at the recognized active preference of 74,417 AUMs (59,533,600 pounds) as shown in Table 2-1. Forage would not be allocated to big game or wild burros, as no allocation presently exists. Existing numbers of burros and big

game, however, would continue to use vegetation to satisfy dietary needs. BLM would hold wild burro populations to existing numbers (843 animals). For this analysis, existing numbers have been estimated as of January 1981. Total vegetation remaining for wild burros, big game, and other resources would amount to 381,950,183 pounds.

After 20 years, livestock would continue to be allocated 74,417 AUMs (59,533,600 pounds). Vegetation remaining for wild burros, big game, and other resources is projected to drop to 372,156,386 pounds. Appendices 2-2 and 2-3 show initial and projected allocations by allotment for this alternative.

Levels of Grazing Management

Yearlong grazing would continue on 799,996 acres of public land in 32 allotments as shown in Table 2-7. No intensive grazing systems would be developed. If requested, supplemental licenses could be issued when ephemeral forage exists and ephemeral grazing does not conflict with other resources. Nonintensive grazing would continue on 14 allotments, involving 45,756 acres of public lands. Ephemeral grazing would continue on two allotments, involving 10,997 acres of public land.

TABLE 2-7
PRESENT GRAZING MANAGEMENT SUMMARY

Yearlong Grazing (32 Allotments--799,996 Public Acres)			
Alamo Crossing		Greenwood Community	
Arrastra Mountain		Greenwood Pk. Community	
Artillery Range		Groom Peak	
Bagdad		Happy Jack Wash	
Bateman Spring		Hot Springs	
Big Sandy		Hualapai Peak	
Black Mesa		Kent's Cane Spring	'A'
Boriana	'A'	La Cienega	
Burro Creek		Lazy YU	'A'
Burro Creek Ranch		Lines	
Cane Springs Wash		Little Cane	
Chicken Springs		Los Molinos	
Chino Springs		Sandy	
Diamond Joe		Walnut Creek	
Francis Creek		Wikieup	
Gray Wash		Yellow Pine	

Nonintensive (14 Allotments--45,756 Public Acres)			
Bottleneck Wash		Kent's Cane Spring	'B'
Byner		Lazy YU	'B'
Fancher Mountain		McElhaney	
Gibson		Round Valley	
JJJ		Sweetmilk	
Kayser Wash		Trout Creek	
Kellis		White Spring	

Ephemeral (2 Allotments--10,997 Public Acres)			
Boriana	'B'	DOR	

Rangeland Developments

BLM would construct rangeland developments needed for the orderly use of the range. Operator-built rangeland developments would be allowed under cooperative agreement or range improvement permit on a case-by-case basis. Existing developments would be maintained and, where necessary to meet wildlife needs, modified according to BLM policy. Numbers and kinds of developments proposed for this alternative are summarized in Table 2-5 and broken out by allotment in Appendix 2-5. Construction costs over the 20-year period would amount to $1,427,300, and annual maintenance costs after all are constructed would be $60,000.

Implementation

The no-action alternative would require no implementation for livestock grazing, since it would be a continuation of existing grazing management. Rangeland developments would be constructed over a 20-year period. Upon completion of the final EIS, BLM would prepare a herd management area plan (HMAP), which would outline a wild burro capture and adoption program designed to maintain burro populations at existing levels. Excess wild burros would be removed yearly thereafter as funding becomes available.

Monitoring and Administration

All allotments would be administered through standard operating procedures described for the proposed action. BLM specialists would periodically inspect allotments and monitor for trespass. Workmonth requirements would remain at existing levels.

MODERATE GRAZING MANAGEMENT

The moderate grazing management alternative provides BLM managers with a less costly and less intensive option for rangeland management. It responds to public concerns about high costs of rangeland development construction and maintenance and to comments regarding adverse impacts to wildlife from proliferation of rangeland developments and livestock grazing.

This alternative differs from the proposed action in that intensive grazing systems are not proposed and initial livestock stocking rates would be 10 percent lower. The 90 percent stocking level is recommended to reduce risk of overstocking during years of low forage production (Martin, 1975a). Utilization of key plant species would be held to 45 percent of average annual production over a 3-year period. The moderate grazing alternative would require substantially fewer rangeland developments than would the proposed action.

Vegetation Allocation

The initial allocation for big game and wild burros would remain the same as under the proposed action. The initial allocation for livestock would amount to 30,819 AUMs (24,655,200 pounds), a reduction of 59 percent from the authorized grazing preference and a reduction of 45 percent from the 5-year averaged licensed use (Table 2-1). Adjustments in AUMs would range from an increase of 5 percent to a reduction of 100 percent[3]. Big game would be allocated 8,589 AUMs (6,871,200 pounds), and burros would be allocated 834 AUMs (667,200 pounds). The remaining 409,290,183 pounds of vegetation would be allocated to other resources (Table 2-2).

After 20 years, public rangelands are projected to provide 36,649 AUMs (29,316,800 pounds) for livestock, 12,212 AUMs (9,769,600 pounds) for big game, 834 AUMs (667,200 pounds) for burros, and 411,882,088 pounds of vegetation for other resources. Appendices 2-2 and 2-3 show initial and projected allocations by allotment for this alternative.

Levels of Grazing Management

Under the moderate grazing alternative, utilization of key species would be limited to an average of 45 percent on all allotments. Less intensive grazing would be applied to 32 allotments, involving 785,470 acres (Table 2-8). No grazing systems would be developed, but BLM would specify livestock numbers, kind of livestock, period of use, and developments needed for the total allotment.

Nonintensive grazing and ephemeral grazing allotments would remain the same as described for the proposed action, except they would be managed to achieve an average of 45 percent utilization of key forage plants.

TABLE 2-8
MODERATE GRAZING MANAGEMENT SUMMARY
MODERATE GRAZING MANAGEMENT SUMMARY

Less Intensive Management (32 Allotments-785,470 Public Acres)

Perennial-Ephemeral

Arrastre Mountain		Gray Wash	
Artillery Range		Greenwood Community	
Bagdad		Greenwood Pk. Community	
Bateman Springs		Groom Peak	
Big Sandy		Happy Jack Wash	
Black Mesa		Hot Springs	
Boriana	'A'	La Cienega	
Burro Creek		Lazy YU	'A'
Burro Creek Ranch		Lines	
Cane Springs Wash	'A'	Little Cane	
Chicken Springs		Los Molinos	
Diamond Joe		Sandy	'A'
Francis Creek		Walnut Creek	
Gibson		Wikieup	

Perennial Only

Kent's Cane Spring	'A'	McElhaney	
Hualapai Peak		Yellow Pine	'A'

Nonintensive Management (15 Allotments-20,226 Public Acres)

Perennial-Ephemeral

Bottleneck Wash		Lazy YU	'B'
Byner		Round Valley	
Cane Springs Wash	'B'	Sandy	'B'
Fancher Mountain		Sweetmilk	
JJJ		Trout Creek	
Kayser Wash		White Springs	
Kellis		Yellow Pine	'B'
Kent's Cane Spring	'B'		

Ephemeral (4 Allotments-51,053 Public Acres)

Alamo Crossing		Chino Springs	
Boriana	'B'	DOR	

Rangeland Developments

Existing developments would be maintained. BLM would construct new livestock management facilities and would authorize operator-built developments on a case-by-case basis when necessary for effective rangeland management. The number and kinds of developments proposed for this alternative are summarized in Table 2-5 and shown by allotment in Appendix 2-5. The initial construction cost would amount to $1,427,300.

Monitoring and Administration

BLM would establish trend, utilization, actual use, and climatic studies on each allotment. Stocking levels would be adjusted as necessary to maintain an average of 45 percent utilization. Forage allocations could later be changed as a result of monitoring and studies. Such changes would consider land use plans and objectives and the needs of all resources.

Implementation

The moderate grazing management alternative would be implemented in the same manner as the proposed action, but no intensive grazing systems would be developed.

Grazing would be administered as it would under the proposed action. An average of 60 additional workmonths would be required each year during implementation. An average of 35 additional workmonths would be required annually after implementation.

[3] See footnote 1, page 16.

WILDLIFE ENHANCEMENT

The wildlife enhancement alternative was developed to analyze the consequences of a grazing program that would emphasize benefits to wildlife habitat. During the preparation of the Hualapai-Aquarius Land Use Plan, several recommendations for preserving crucial habitat and enhancing wildlife habitat quality were developed in MFP Step 1. These recommendations responded to concerns raised by government agencies and various segments of the public. The multiple-use analysis in MFP Step 2, however, revealed conflicts with other resource proposals and led to many of these recommendations being dropped or modified. The wildlife enhancement alternative would implement the MFP Step 1 wildlife recommendations that were not carried through MFP Step 2 but that directly affect rangeland management. This alternative provides BLM managers a wider range of options for decisionmaking and responds to significant issues identified during the planning and scoping process.

The primary objectives of the wildlife enhancement alternative are to facilitate recovery of important riparian areas and to improve habitat used by big game and by threatened, endangered, State-listed, and sensitive wildlife. Other resource uses would be accommodated only to the extent that these objectives would be met.

Vegetation Allocation

Wildlife enhancement would allocate forage to reasonable numbers of big-game species (26 elk, 3,384 mule deer, 30 desert bighorn sheep, 95 pronghorn antelope, and 1,214 javelina), numbers averaging 20–25 percent greater than estimates of existing populations on public lands in the EIS area. More immediate habitat improvement and increases in wildlife populations would be allowed than under the proposed action (Figure 2-1). Present and reasonable numbers of big game are listed in Appendix 2-6.

Vegetation would not be allocated to livestock and wild burros in areas constrained by MFP Step 1 wildlife recommendations (Table 2-9 and Map 2-1).

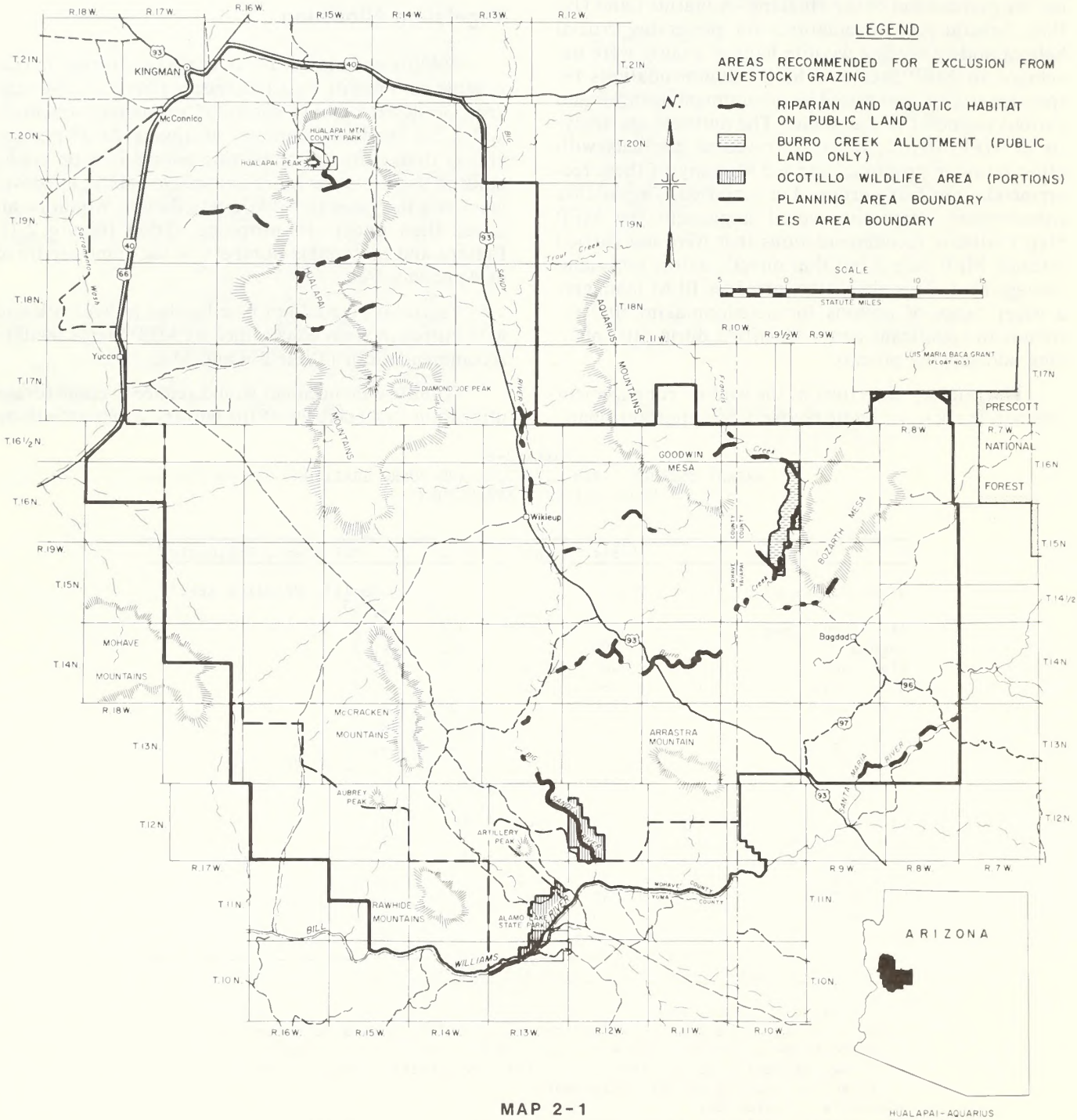
Wildlife enhancement would reduce average forage utilization to 40 percent of the current year's growth on

TABLE 2-9
AREAS[1] EXCLUDED FROM LIVESTOCK AND BURRO GRAZING
UNDER WILDLIFE ENHANCEMENT

Allotment	Acres	(Miles)	AUMs[2]	MFP Step 1 Rationale
Alamo Crossing	2,850		--[3]	Ocotillo Wildlife Area[4]
	190	(3.0)	--[3]	R, A[5]
Artillery Range	180	(2.5)	9.0	R, A
Bagdad	100	(2.5)	5.0	R, A
Big Sandy	400	(2.5)	20.0	R, A
Black Mesa	90	(2.0)	4.0	R, A
Burro Creek	4,220		181.0	S
	600	(6.0)	30.0	R, A
Burro Creek Ranch	150	(1.0)	7.0	R, A
Chino Springs	3,500		--[3]	Ocotillo Wildlife Area
Francis Creek	210	(6.0)	10.0	R, A
Gibson	180	(6.0)	9.0	R, A
Greenwood Peak Community	600	(5.0)	30.0	R, A
Hualapai Peak	120	(2.5)	6.0	R
Kent's Cane Spring	130	(4.5)	6.0	R
McElhaney	120	(3.0)	6.0	R, A
Walnut Creek	180	(6.0)	9.0	R
Yellow Pine	100	(2.5)	5.0	R
Byner	100	(1.0)	5.0	R
TOTAL	14,020	(56.0)	342.0	

[1] Involves only public land.
[2] AUMs of forage were calculated on the basis of 0.05 AUMs/acre except for Burro Creek allotment, where the AUM figure represents all public land forage allocated to livestock. Wildlife optimization would eliminate livestock grazing on this allotment.
[3] Ephemeral allotments.
[4] The Ocotillo Wildlife Area, surrounding Alamo Lake, was established to preserve wildlife habitat. The Army Corps of Engineers administers the area, and BLM administers grazing on it. AG&FD manages fish and waterfowl in the area under cooperative agreement with Arizona State Parks and with a license from the Corps of Engineers.
[5] R = Riparian Protection; A = Aquatic Protection; S = Sensitive Species Habitat Protection.

WILDLIFE ENHANCEMENT ALTERNATIVE



MAP 2-1

key species (see Glossary) in any pasture at any time, when controllable by livestock. The following allotments, lacking wildlife conflicts, would be managed for 50 percent average utilization.

Fancher Mountain
Diamond Joe
Chino Springs
Greenwood Community
Artillery Range (North of DOR)
DOR
Hot Springs
Round Valley

Initial stocking on the remaining allotments would be 20 percent below recommendations for livestock under the proposed action. Livestock would be allocated 27,272 AUMs (21,817,600 pounds), a reduction of 63 percent from authorized grazing preference and a reduction of 51 percent from the 5-year averaged licensed use (Table 2-1). Reductions in AUMs would range from 4 to 100 percent.[4] Burros would be allocated the same amount of forage (834 AUMs or 667,200 pounds) as under the proposed action. Initial allocation to big game would amount to 12,212 AUMs (9,769,600 pounds). The remaining 409,229,383 pounds of vegetation would be allocated to other resources.

After 20 years this alternative would provide an estimated 14,577 AUMs (11,661,480 pounds) to big game, 834 AUMs (667,200 pounds) to burros, 37,268 AUMs (29,814,702 pounds) to livestock, and 418,186,701 pounds of vegetation to other resources (see Table 2-2). Appendices 2-2 and 2-3 show initial and projected allocations by allotment for this alternative.

Levels of Grazing Management

Grazing management would be the same as under the proposed action, except ephemeral grazing would not be authorized in certain areas (Table 2-10 and Map 2-2) to protect and enhance desert tortoise crucial habitat. Livestock grazing would be discontinued in the Burro Creek allotment to allow recovery of riparian habitats and to benefit protected animal species, including black hawks and bald eagles.

Rangeland Developments

Construction

Developments would be constructed as under the proposed action except where constrained by MFP Step 1 wildlife recommendations. To avoid conflicts with big game, new livestock developments would not be built in big-game crucial habitat (Table 2-11 and Map 2-3). Riparian habitats would be fenced to halt deterioration due to grazing and to facilitate long-term recovery. Livestock waters would be piped out of riparian or aquatic areas containing existing or proposed windmills, wells, or other water developments. New livestock waters would be developed only if they would not increase livestock utilization in crucial wildlife habitat. The approximate numbers and types of developments needed to implement this alternative are summarized in Table 2-5. Appendix 2-5 shows proposed developments by allotment. Initial construction would cost $2,841,200, and annual maintenance would cost $113,000.

Maintenance

Maintenance would be the same as under the proposed action.

Implementation, Monitoring, and Administration

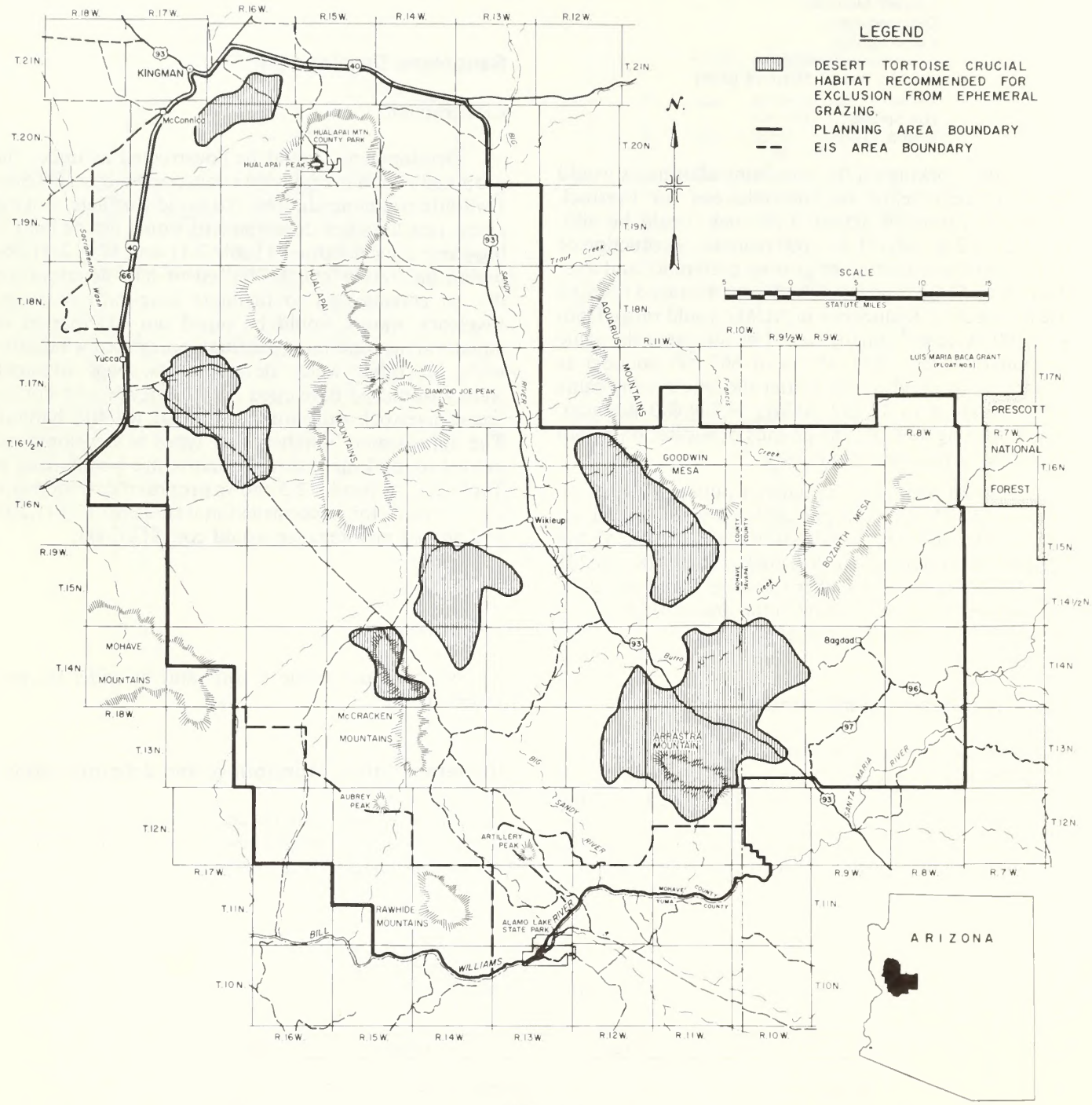
These actions would occur as described for the proposed action. No changes in kind of livestock would be authorized under this alternative.

[4] See footnote 1, page 16. Livestock grazing on public lands in the Burro Creek allotment would be phased out over a 3-year period.

TABLE 2-10
AREAS EXCLUDED FROM EPHEMERAL GRAZING TO PROTECT
DESERT TORTOISE CRUCIAL HABITAT UNDER
WILDLIFE ENHANCEMENT

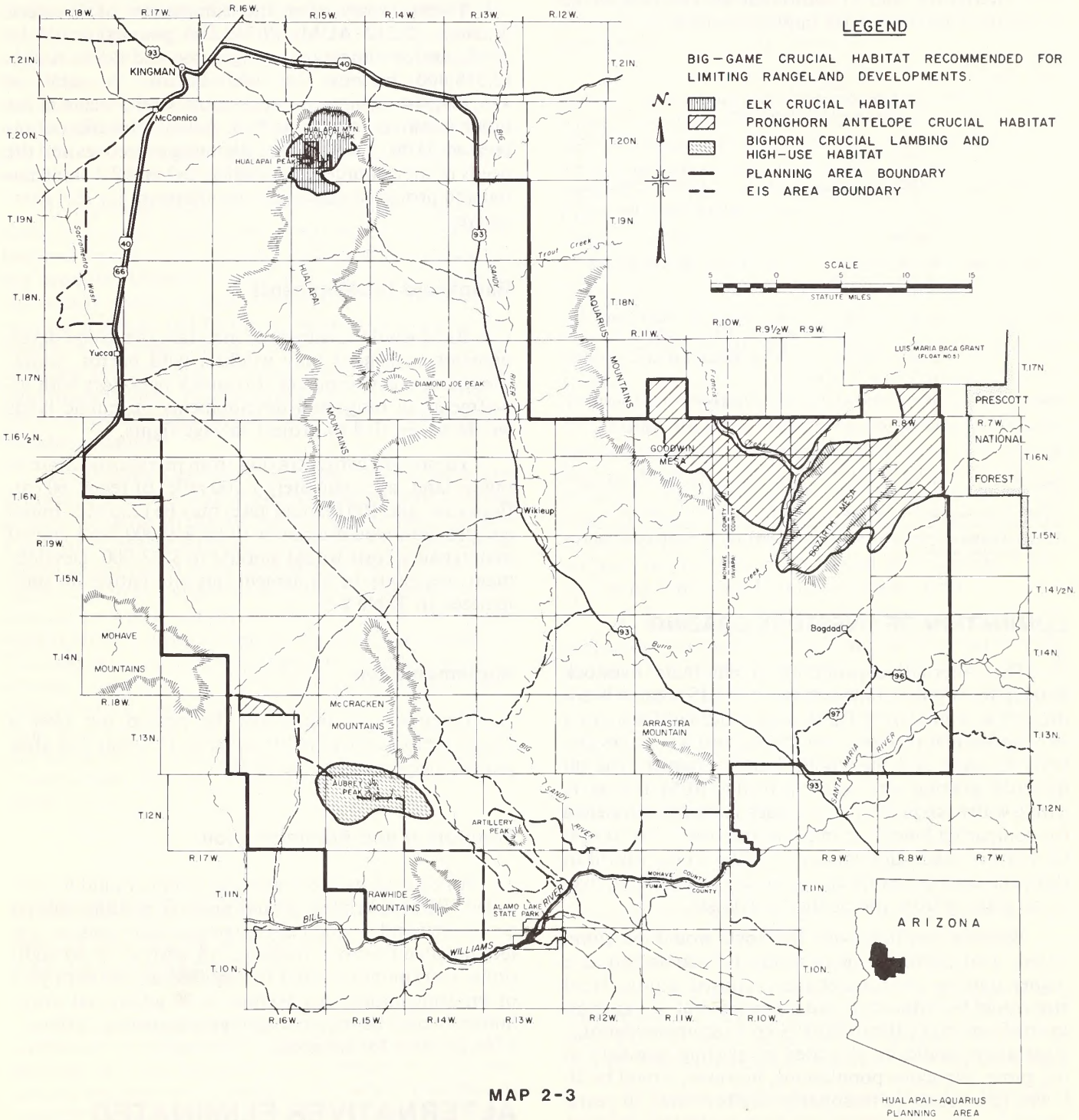
Allotment	Acres	Allotment	Acres
Arrastra	16,000	Greenwood Pk. Community	7,700
Bagdad	7,700	Groom Peak	1,600
Black Mesa	6,400	Happy Jack Wash	7,700
Boriana	300	La Cienega	4,100
Burro Creek Ranch	27,500	Lazy YU	3,200
Chicken Springs	12,100	Los Molinos	2,240
Francis Creek	12,100	Lines	3,500
Greenwood Community	200	Wikieup	1,300

WILDLIFE ENHANCEMENT ALTERNATIVE



MAP 2-2

WILDLIFE ENHANCEMENT ALTERNATIVE



MAP 2-3

Work Force Requirements

An estimated 100 additional workmonths per year would be required to implement the wildlife enhancement alternative, and 45 additional workmonths would be required annually after implementation.

TABLE 2-11
RANGELAND DEVELOPMENT RESTRICTIONS
UNDER WILDLIFE ENHANCEMENT

Allotment	Rangeland Development Restriction	Acres	Rationale from MFP Step 1
Artillery Range	No New Fencing No New Livestock Waters	6,500	Bighorn Crucial Habitat*
Bateman Spring	No New Fencing No New Livestock Waters	8,300	Bighorn Crucial Habitat
Burro Creek	No New Fencing	1,500	Pronghorn Crucial Habitat
Chicken Springs	No New Fencing No New Livestock Waters	4,550	Bighorn, Pronghorn Crucial Habitat
Francis Creek	No New Fencing	25,600	Pronghorn Crucial Habitat
Hualapai Peak	No New Fencing	1,900	Elk Crucial Habitat
McElhaney	No New Fencing	5,100	Pronghorn Crucial Habitat
Sweet Milk	No New Fencing	200	Pronghorn Crucial Habitat
Yellow Pine	No New Fencing	5,100	Elk Crucial Habitat

* Crucial habitat is habitat important to survival of a species within the planning area.

ELIMINATION OF LIVESTOCK GRAZING

This alternative proposes to eliminate livestock grazing from public rangelands in the EIS area. It is addressed as a matter of BLM policy and conforms to a 1979 agreement reached with the Natural Resources Defense Council and the Public Lands Council. The no livestock grazing alternative provides BLM managers with a wider range of options under study and a baseline for comparing long-term impacts and benefits to rangelands from other alternatives. It will also be helpful to show the environmental consequences of removing livestock grazing from the public rangelands.

Because conflicts with livestock would be eliminated, wild burro numbers would be maintained at a higher number than under the proposed action. Herd size would be reduced to and maintained at 483 animals to conform to the Burro MFP Step I recommendations. Vegetation would be allocated to existing numbers of big game. Big-game populations, however, would be allowed to increase to reasonable numbers over 20 years.

Vegetation Allocation

BLM would cancel all grazing preference and allocate no vegetation to livestock. BLM would initially allocate 8,589 AUMs (6,871,200 pounds) for big game and 2,898 AUMs (2,318,400 pounds) for wild burros, leaving 432,294,183 pounds of vegetation for other resources.

Twenty years after the elimination of livestock grazing, 12,212 AUMs (9,769,600 pounds) could be available for allocation to big game and 2,898 AUMs (2,318,400 pounds) to wild burros. A total of 436,749,914 pounds of vegetation would remain for other resources (see Table 2-2). Actual allocation of increased AUMs would reflect planning objectives and the needs of all resources. Appendices 2-2 and 2-3 show initial and projected allocations by allotment for this alternative.

Rangeland Developments

BLM would construct or maintain rangeland developments to benefit only wildlife, wild burros, watershed, and other resources. Livestock operators with investments in rangeland developments on public lands would be entitled to project salvage rights.

To prevent cattle straying from private and State to public land, approximately 1,500 miles of fence, 60 cattleguards, and 100 manual gates may be required. Initial construction would amount to $6,949,000, and annual maintenance costs would amount to $233,000. Developments necessary to implement this alternative are summarized in Table 2-5.

Implementation

Livestock grazing would be phased out over a 3-year period following the filing of the final EIS after grazing decisions become final.

Monitoring and Administration

All existing livestock grazing permits would be cancelled. BLM specialists would monitor wildlife habitat conditions and periodically inspect public lands to detect possible livestock trespass. An average of 40 additional workmonths would be required during each year of implementation. An average of 20 additional workmonths would be required each year thereafter, primarily to monitor for trespass.

ALTERNATIVES ELIMINATED FROM STUDY

During development of the land use plan and the scoping process, the following alternatives were considered for study but not included in the EIS.

1. Any alternative, other than no action, that would set initial stocking rates above the estimated carrying capacity of the land.

2. Optimize Utilization of Vegetation. This alternative would have used computer analysis to derive the best mix of grazing animals to achieve maximum use of vegetation without exceeding allowable use factors. It was dropped from further study because the results would bear no relation to reasonable numbers and kinds of animals, or the needs of other resources. The alternative did not come out of the planning process, nor would it meet any broad planning objectives.

3. Optimize Livestock. This alternative was eliminated from study because the proposed action optimizes livestock to the extent possible without exceeding carrying capacity. Dietary overlap with big-game species in this area is relatively small. Consequently, reductions in wildlife numbers and further reductions in burro populations would result in a minimal increase in AUMs available for livestock. Moreover, all significant rangeland management recommendations in MFP Step 1 were carried through to the MFP Step 2, multiple-use recommendations.

4. Stocking Level by Condition Class. Evaluation of this alternative was suggested during the scoping process because of its successful use in the Shivwits (Arizona) Grazing EIS (BLM, 1979c). This alternative would adjust initial stocking levels on the basis of average condition and apparent trend of the allotments. The alternative was dropped, however, because the rangeland inventory method used for the Hualapai-Aquarius Planning Area considered rangeland condition in determining vegetation production on individual range sites. Allocation of vegetation was thus adjusted for condition class. Further reductions of livestock numbers below recommendations in the proposed action would be unwarranted and impose indefensible hardships on livestock operators.

MEASURES FOR RESOURCE PROTECTION AND ENHANCEMENT

BLM policy requires the use of standard protective measures in its rangeland program implementation. The purpose of these measures is to reduce or eliminate adverse environmental impacts and, where possible, to enhance resources. The following restrictions and standard operating procedures apply to all developments constructed in the EIS area. Measures that apply to other aspects of the grazing program are also included.

1. An interdisciplinary team of resource specialists will review all rangeland development proposals to ensure maximum multiple-use benefits.

2. All proposals will be evaluated in an environmental study of appropriate scope to determine site-specific impacts. At the minimum, studies will address cultural resources, protected plant and animal species, visual resources, and wilderness values. If needed, additional mitigating measures will be developed to reduce or eliminate site-specific impacts.

3. Before surface-disturbing projects are approved, a cultural resource evaluation will be completed, including intensive field inventories (Class III) of potential impact areas (BLM Manual 8111.14). If any historic or archaeological properties are found, their eligibility for inclusion in the National Register of Historic Places will be determined in consultation with the Arizona State Historic Preservation Officer (SHPO) (36 CFR 1204). BLM will act to avoid impacts to cultural resources by redesigning or relocating the project whenever feasible. If impacts are unavoidable, BLM will consult with the SHPO to develop mitigating measures to reduce or eliminate adverse impacts upon cultural resources. The consultation will follow procedures outlined in the Programmatic Memorandum of Agreement of January 14, 1980 (Appendix 2-8). Cultural resource mitigation will be completed before project construction begins. If buried cultural remains are found during construction, the construction will stop and BLM will be notified. These measures will ensure compliance with the Antiquities Act of 1906, the National Historic Preservation Act of 1966, the National Environmental Policy Act of 1969, and Executive Order 11593.

4. Before construction, BLM will conduct a site evaluation for State protected and BLM sensitive plant species. Where possible, projects will be located to avoid impacts to large numbers of protected plants or their habitat. Where a project would result in unacceptable impacts, plants will be salvaged or transplanted, or the project will be abandoned. BLM will notify the Arizona Commission of Agriculture and Horticulture 30 days in advance of actions that would affect plants protected under the Arizona Native Plant Law.

5. Before constructing facilities, BLM will conduct a site evaluation for State protected and BLM sensitive animals. BLM will develop mitigation necessary to protect these species and their habitats, including project relocation, redesign, or abandonment.

6. If a project is proposed within the habitat of a threatened or endangered species, BLM will consult with FWS in accordance with the Endangered Species Act of 1973, as amended, and take appropriate action.

7. Before constructing projects in the Big Sandy lakebed formation or other known locations of important fossils, BLM will complete a paleontological evaluation. If the evaluation determines that important paleontological resources would be adversely impacted, all feasible means to reduce or eliminate the impacts will be considered, including project redesign, relocation, or abandonment.

8. BLM will complete contrast ratings for all proposed rangeland developments and recommend appropriate mitigating measures to ensure that visual resource management class objectives are met.

9. All proposed rangeland developments will be consistent with the purpose for which recreation designations or developments are formally recommended in Step 2 of the Hualapai-Aquarius MFP.

10. All rangeland management activities proposed for lands under wilderness review will meet the nonimpairment standard according to BLM's "Interim Management Policy and Guidelines for Land Under Wilderness Review" (BLM, 1979b). If the project does not meet the nonimpairment standard, it will be redesigned, moved outside the study area, cancelled upon wilderness designation, or delayed until the area is dropped from further wilderness consideration. Specific guidelines developed in the Interim Management Policy for rangeland management on lands that remain under wilderness review have been placed in Appendix 2-9. Nonimpairment criteria have been reproduced in Appendix 2-10.

11. During construction of rangeland developments, vehicles will use existing roads and trails wherever possible for access to sites. Where feasible, and where no roads exist, vehicles will travel cross-country to avoid the need for road building. Where new roads must be constructed, roadbeds will be no wider than necessary for reliable access; BLM specifications will also be used to reduce erosion and gullying.

12. During construction of all rangeland developments, disturbance to surface resources will be held to a minimum. After construction, disturbed surfaces will be restored to a natural condition so far as is practicable.

13. Fences proposed in big-game habitat will be designed to reduce adverse impacts to the movement of big game. Standard specifications established in BLM Manual 1737 and the 1737 Arizona BLM Supplement will be used. BLM will consult with the Arizona Game and Fish Department on the design and location of all new fences.

14. Where existing fences in big-game habitat do not meet BLM specifications, they will be modified according to BLM Manual 1737 when they are scheduled for replacement or major maintenance.

15. Blading of new roads to facilitate fence construction will not be permitted. Vehicles will travel overland, or fences will be constructed by hand.

16. All livestock watering facilities will provide safe, usable water for wildlife. As funding and opportunities permit, existing facilities will be modified for safe wildlife use. The following standards apply to design and modification of livestock waters.

- Livestock troughs and tanks will not exceed 20 inches above the ground. BLM will install wildlife escape ladders in each facility and, where feasible, provide ramps for small bird and mammal access. Storage tanks will have either a metal or floating vinyl cover to reduce evaporation and prevent wildlife from drowning.

- Ground-level wildlife water developments will be established on livestock waters where feasible. An exclosure of 3 to 7 acres containing the water source, storage, and any related riparian habitat will be constructed to exclude livestock. Where terrain permits, livestock water will be provided at least 0.25 miles outside of the fenced exclosure.

- Earthen reservoirs and adjacent riparian habitat may be completely or partially fenced from livestock entry where feasible.

- Developed spring sources, related storage, and adjacent riparian habitat will be fenced to exclude livestock.

- Where practical, water troughs and tanks will be kept full year round to provide a continuous water supply for wildlife.

17. Allotment management plans, habitat management plans, and herd management area plans will determine specific measures to protect riparian habitats and to improve and maintain instream water quality. Where necessary, the plans will call for exclusion of grazing animals through fencing, deferment, or other actions to provide for broadleaf tree reproduction and long-term enhancement.

18. To the extent possible, BLM will not authorize construction of rangeland developments that will result in heavy livestock concentrations within crucial desert tortoise habitat. Grazing practices will consider ways to increase desert tortoise forage production and to reduce tortoise-livestock competition for ephemeral forage in crucial habitat areas.

19. Broadleaf tree reproduction will be improved by supplemental plantings of 4- to 5-year old seedlings in suitable riparian habitats along Burro and Francis Creeks. Stands will be fenced to exclude livestock and wild burros to allow seedling establishment and growth. Fences will be removed once the seedlings have matured and are no longer subject to damage from grazing.

20. When grazing decisions are prepared, if wild burro populations have not been reduced to numbers recommended in MFP decisions, vegetation allocations to burros will be increased to reflect current numbers. Initial livestock stocking levels will be reduced accordingly to prevent overcommitting of forage. As burro populations are reduced, BLM will increase vegetation allocation to livestock on an allotment-by-allotment basis.

21. To the extent possible, wild burros will be removed for 7 to 10 years from public rangelands next to Burro Creek in herd area 1B to improve riparian habitat and allow regeneration of plants heavily impacted by burro use. Burros will be removed in accordance with a

herd management area plan prepared by the Kingman Resource Area. (Under the Wildlife Enhancement Alternative, wild burros and livestock would be permanently excluded from riparian areas on public rangelands along Burro Creek).

22. BLM will develop a fire management program for key areas within the planning area. Objectives will be to maintain desired plant communities, open stagnant chaparral, recycle nutrients, and prepare seedbeds. Fire management plans will identify prescribed burn areas, modified suppression areas, and intensive control areas.

23. MFP Step 2 recommendations identify a number of studies that BLM would conduct, subject to available funding and personnel, to determine the effects of specific grazing management activities on various rangeland resources. Information from the studies would be used to adjust grazing management practices to meet planning goals. Details of the studies, including objectives and recommended timeframes, may be found in the following sections of the Hualapai-Aquarius MFP: Rangeland Management (RM 1.5, RM 1.6, RM 3.1); Watershed (W 3.2d, W 3.2h, W 5.1, W 5.2); Wildlife (WL 1.4, WL 2.4, WL 3.4, WL 4.3, WL 7.5, WL 7.7, WL 7.8, WL 8.1, WL 8.2); Cultural Resources (CR 1.1, CR 1.2).

INTERRELATIONSHIPS

BLM's management of public lands in the EIS area is related to projects or management practices of other Federal and State agencies and, to an extent, private enterprise.

Because BLM manages such a large percentage of the lands in the EIS area, its management practices strongly influence State and private lands interspersed within public lands. Close coordination between the various land managing agencies is required to accomplish goals and avoid resource use conflicts.

FEDERAL PROGRAMS

U.S. Fish and Wildlife Service

BLM must consult with the Fish and Wildlife Service (FWS) when a BLM proposal may impact threatened or endangered plant or animal species or their habitats. BLM has initiated consultation for the Hualapai-Aquarius grazing management proposal in accordance with Section 7 of the Endangered Species Act. FWS also has responsibility for animal damage control programs and has entered into a cooperative agreement (1976) with BLM and other agencies in Arizona to coordinate interagency involvement in such programs.

U.S. Army Corps of Engineers

The Corps of Engineers administers Federal lands surrounding Alamo Reservoir on the Bill Williams River, which have been withdrawn for flood control purposes. These lands form portions of five grazing allotments. BLM administers grazing on these lands, subject to the Corps' flood control management.

Soil Conservation Service

BLM must coordinate with the Soil Conservation Service (SCS) to meet numerous planning goals and resource management objectives. Details of this coordination are contained in'"The Supplemental Agreement to the National Memo of Understanding Among Soil Conservation Service, Bureau of Land Management, U.S. Forest Service, State Land Department, and Natural Resource Conservation Districts." SCS also provides valuable assistance to BLM in completing rangeland inventories and coordinating with livestock operators.

STATE PROGRAMS

Arizona State Land Department

The Arizona State Land Department (SLD) administers 93,152 acres of State Trust lands within the EIS area. SLD leases most of these lands for livestock grazing. BLM and SLD coordinate grazing administration on public and State Trust lands interspersed within the same allotments. Cooperative agreements signed by both agencies in May and August 1979 require coordination of rangeland inventories and consultation during land use planning to achieve consistency between the two agencies. Further coordination with SLD is crucial before issuing decisions and developing AMPs.

Arizona Game and Fish Department

The Arizona Game and Fish Department (AG&FD) manages wildlife in Arizona. BLM manages wildlife habitat on public lands in the State and must coordinate its activities with AG&FD. Under cooperative agreement (1976) AG&FD assists BLM in planning rangeland developments and developing land use plans. BLM also cooperates with AG&FD in constructing wildlife facilities, preparing habitat management plans, completing wildlife surveys, and introducing game species to the public lands. AG&FD personnel contributed substantially to the development of big-game population estimates and wildlife recommendations in the Hualapai-Aquarius Land Use Plan.

Arizona State Historic Preservation Officer

BLM must coordinate with the Arizona State Historic Preservation Officer (SHPO) in meeting the requirements of Section 106 of the National Historic Preservation Act and 36 CFR 800. Details of this coordination are contained in the Rangeland Programmatic Memorandum of Agreement dated January 14, 1980 (Appendix 2-8). The agreement identifies actions BLM and SHPO will take to protect cultural and historical values from adverse impacts of the rangeland program.

Arizona State Clearinghouse

BLM is required by agreement and Federal policy to notify the Arizona State Clearinghouse (within the Office of Economic Planning and Development) of major BLM programs, including land use plans and EISs. The clearinghouse then forwards the notification to interested or affected State agencies and political subdivisions, which in turn may respond to the proposal.

RELATED ACTIONS

BLM is required to consult with the District Engineer, Arizona Department of Transportation, when proposed rangeland developments would impact highway facilities or right-of-way fences. The District Engineer approves proposals on an individual project basis.

Where projects would impact county roads, approval must be obtained from the County Board of Supervisors.

SUMMARY OF IMPACTS

The analysis of the environmental consequences of the proposed action and alternatives reveals that none of the alternatives would measurably impact climate, topography, geology, minerals, air quality, urban land uses, social attitudes, or wilderness values. Significant impacts, beneficial and adverse, would occur to vegetation, wildlife, wildlife habitat, wild burros, livestock grazing operations, and local ranch economics. Impacts would be less severe to recreation, visual resources, cultural resources, water quality, and soils.

Table 2-12 summarizes significant, long-term impacts by alternative. Projected response of vegetation for each alternative is compared in Figure 2-1. For a more detailed analysis of impacts, see Chapter 4.

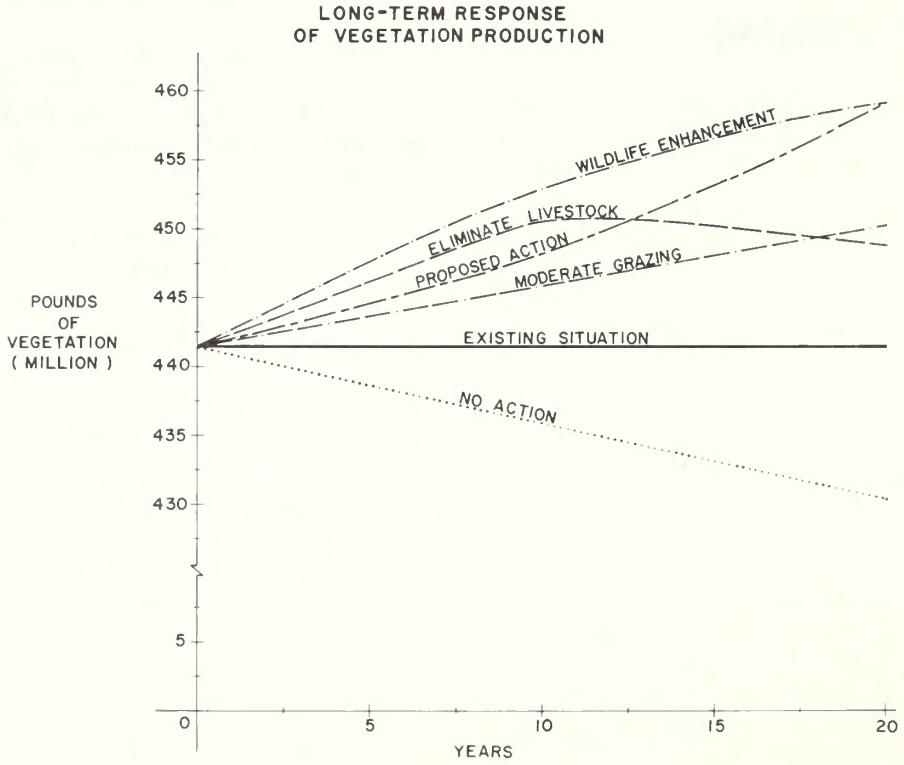


Figure 2-1.

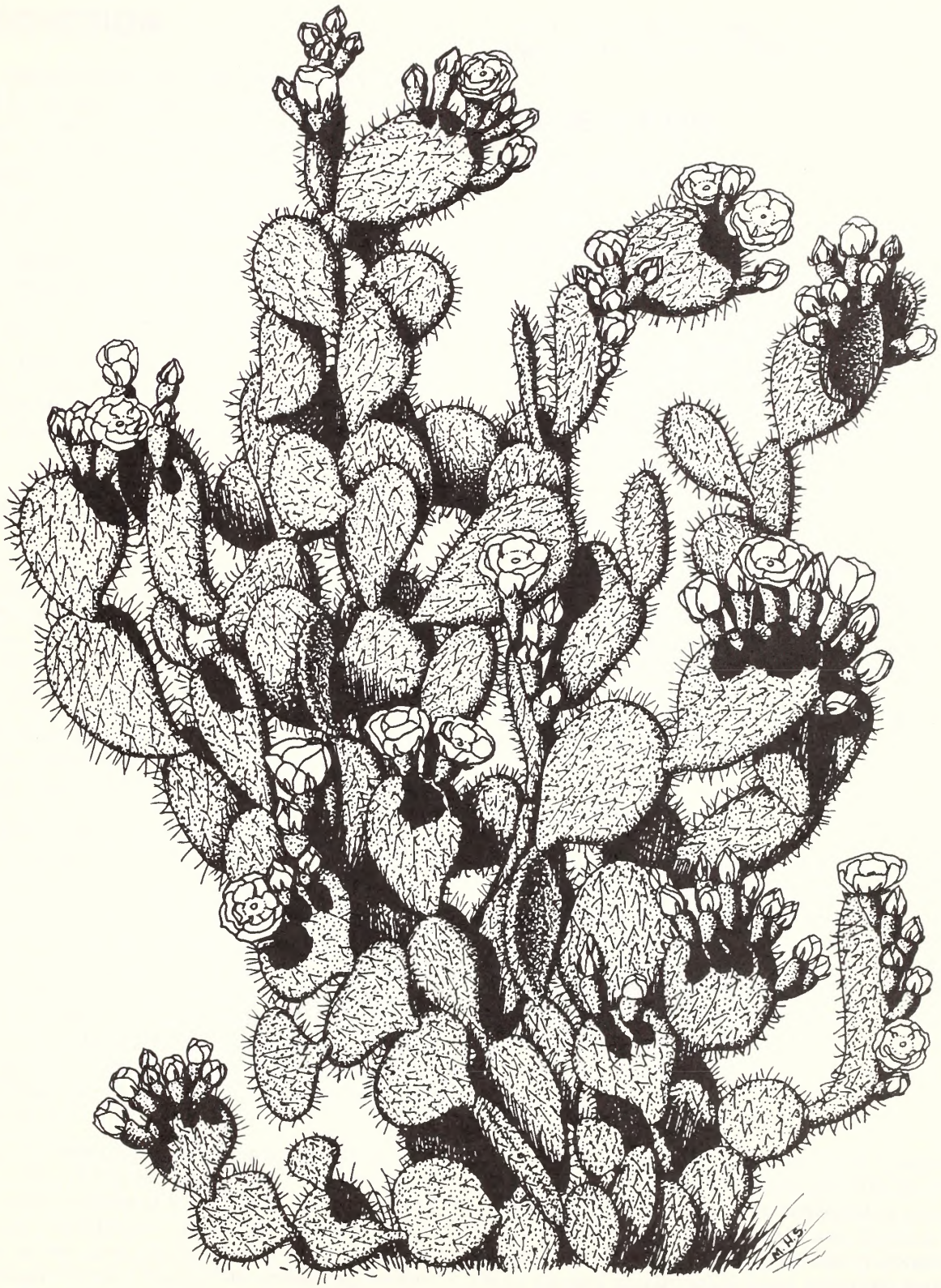
The curves represent estimated vegetation production in the EIS area over a 20-year period for each alternative. While general comparisons are made possible, actual vegetation production at any one time might vary from that shown in this figure.

TABLE 2-12
IMPACT SUMMARY

Resource Elements	Existing Situation	Proposed Action	No Action	Moderate Grazing	Wildlife Enhancement	Eliminate Livestock
Vegetation						
Usable Forage Production (lbs.)	99,242,065	118,015,565	89,375,468	109,320,371	118,015,565	106,401,856
Plant Cover (%)	22	25	19	24	25	23
Range Condition (acres):						
Excellent	20,724	247,279	11,194	176,339	247,279	181,625
Good	280,791	415,407	135,907	287,627	415,407	155,938
Fair	466,231	142,340	296,050	266,474	142,340	430,215
Poor	89,003	51,723	413,598	126,309	51,723	88,971
Soils						
Sediment Yield (acre-feet/mi^2/year)	0.33	0.32	0.36	0.32	0.32	0.30
Acres Permanently Disturbed	NA[1]	228	111	111	197	156
Erosion Condition (acres):						
Critical-Severe	9,384	Improve	Continue to	Improve	Improve	Improve
Moderate	97,523	Improve	Deteriorate	Improve	Improve	Improve
Erosion:						
Intensive & Less Intensive Allotments	NA[1]	Decrease	Increase	Decrease	Decrease	Decrease
Nonintensive Allotments	NA[1]	Increase	Increase	Increase	Increase	Decrease
Ephemeral Allotments	NA[1]	No Change	No Change	No Change	No Change	No Change
Water Resources						
Consumption by Grazing Animals (acre-feet)	38	50	77	41	42	30
Sediments	NA[1]	Decrease	Increase	Unaffected	Decrease	Decrease
Nutrient Pollutants	NA[1]	Decrease	Unaffected	Unaffected	Decrease	Decrease
Runoff	NA[1]	Decrease	Increase	Decrease	Decrease	Decrease
Fecal Coliform	NA[1]	Unaffected or increase	Unaffected	Unaffected or increase	Decrease	Decrease
Wildlife						
Big-Game Forage (AUMs)	0	12,388	0	12,212	14,577	12,212
Big-Game Numbers (Public Land):						
Elk	16	26	12	26	30	26
Mule Deer	2,687	3,427	2,150	3,384	4,091	3,384
Pronghorn Antelope	81	125	65	95	150	95
Desert Bighorn Sheep	19	30	17	30	40	30
Javelina	154	1,214	200	1,214	1,214	1,214
Wildlife & Habitat Impacts:						
All Wildlife	NA[2]	No Impact	Adverse	Slight to None	Beneficial	Beneficial
Riparian	NA[2]	Low Adverse	High Adverse	Adverse	Beneficial	Beneficial
Wild Burros						
Burro Forage (AUMs)	0	834	0	834	834	2,898
Burro Population	843	139	843	139	139	483
Cultural Resources						
Change in Adverse Impacts to Cultural Resources	NA[2]	Moderate Increase	Moderate Increase	Moderate Decrease	Slight Decrease	High Decrease
Recreation (Visitor Days)						
Big-Game Hunting	30,600	52,128	25,882	48,712	54,927	48,712
Livestock Grazing						
Allocated AUMs (Maximum Allowable on Public Lands)	74,417	46,117	74,417	36,603	36,996	0
Livestock Performance						
11 Small Ranches (0-151 head)						
Calf Crop (%)	55	63	55	61	63	NA[2]
Steer Calf Weaning Weight (lbs.)	510	561	485	561	561	NA[2]
Heifer Calf Weaning Weight (lbs.)	480	528	456	528	528	NA[2]
Cull Cow (%)	20	17	20	18	17	NA[2]
10 Medium-Size Ranches (151-300 head)						
Calf Crop (%)	62	71	62	68	71	NA[2]
Steer Calf Weaning Weight (lbs.)	490	539	465	539	539	NA[2]
Heifer Calf Weaning Weight (lbs.)	417	459	396	459	459	NA[2]
Cull Cow (%)	17	14	17	15	14	NA[2]
10 Large Ranches (>300 head)						
Calf Crop (%)	62	71	62	68	71	NA[2]
Steer Calf Weaning Weight (lbs.)	516	568	490	568	568	NA[2]
Heifer Calf Weaning Weight (lbs.)	437	481	415	481	481	NA[2]
Cull Cow (%)	17	14	17	15	14	NA[2]
Economic Conditions						
Net Revenues ($):						
Small Ranch	2,215	3,186	1,707	2,101	2,295	88
Medium-Size Ranch	10,567	11,405	8,592	7,735	8,958	1,703
Large Ranch	18,435	34,115	13,692	21,945	25,849	2,486
30-Year Net Revenue Value:						
Small Ranch	23,582	26,562	23,582	18,723	18,055	1,078
Medium-Size Ranch	115,647	98,352	115,647	72,358	74,860	20,862
Large Ranch	250,050	261,097	250,050	175,470	189,423	30,463
Workyears (%)[3]	47.77	42.40	42.64	32.38	33.87	11.60
Ranch Values ($)						
Small Ranch	131,625	133,920	131,625	75,600	77,400	22,500
Medium-Size Ranch	412,500	313,200	412,500	228,600	232,200	75,000
Large Ranch	1,394,750	1,359,000	1,394,750	986,400	995,400	475,500
Operating Expenses ($)	967,370	839,650	923,680	693,000	698,470	417,020
Gross Receipts ($)	1,279,540	1,326,710	1,163,590	1,010,810	1,069,490	459,790

[1] NA = Data not available.
[2] NA = Not applicable.
[3] Refer to Glossary for definition of a workyear.

CHAPTER 3
AFFECTED ENVIRONMENT



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CHAPTER 3

AFFECTED ENVIRONMENT

INTRODUCTION

This chapter briefly describes resources that may be impacted by the alternatives including the proposed action. Descriptions are only as detailed as is necessary for the reader to understand the effects of alternatives. Consequently, where impacts to certain resources would be negligible or nonexistent, descriptions are correspondingly brief or are not included.

More detailed descriptions of resources in the EIS area and regional socioeconomic conditions may be found in the Hualapai and Aquarius Unit Resource Analyses (BLM, 1980a;b), the Hualapai-Aquarius Planning Area Analysis (BLM, 1980c), and the Lower Colorado Social-Economic Profile (BLM, 1979d). Copies of these documents may be reviewed in BLM's Kingman Resource Area and Phoenix District Offices.

PHYSICAL SETTING

The EIS area is located in west-central Arizona in the Mountain region of the Basin and Range physiographic province. Its landforms are typical of this province, consisting of broad desert basins bounded by relatively low mountain ranges. The Hualapai Mountains in the northwest EIS area and the Aquarius Mountains in the central EIS area are the principal ranges. Basalt mesas dominate the eastern EIS area and are divided by Burro Creek and its tributaries. The Big Sandy, Bill Williams, and Santa Maria Rivers are the other major drainages in the area. Elevations range from approximately 1,000 feet on the Bill Williams River to 8,226 feet on Hualapai Peak.

The climate in the EIS area is influenced by the tropical Atlantic (Gulf of Mexico) and the tropical Pacific air masses. The average annual temperature varies from 58 °F near Bagdad to more than 68 °F at Alamo Dam. An extreme low of − 5 °F has been recorded in the Hualapai Mountains, and an extreme high of 122 °F has been recorded at Alamo Dam. The frost-free growing season ranges from 180 days at the higher elevations to 240 days in the valleys on the west end of the EIS area (BLM, 1980a;b).

Annual precipitation varies from 6.6 inches at Yucca to 13.7 inches at Bagdad. Annual lows of less than 1 inch have been recorded at Yucca, and annual highs of over 37 inches have been recorded near Bagdad. Forty-six percent of the total precipitation occurs from December through March. Much of the remaining precipitation occurs during heavy thundershowers from July through October (BLM, 1980a;b).

VEGETATION

VEGETATION TYPES

The EIS area supports a variety of plant species, resulting from the area's diversity of soil types, elevations, exposures, temperatures, precipitation, and existing and past uses. Nine broad vegetation types based on dominant species aspect have been identified in the EIS area. Their locations are shown on Plate 2 and Map 2-1, and their characteristics are summarized in Table 3-1. BLM obtained vegetation information from the rangeland inventory described in Chapter 1 and Appendix 1-1. These data are on file at the Phoenix District and Kingman Resource Area Offices.

Chaparral

Chaparral occupies 9 percent (81,486 acres) of the public lands in the EIS area. This type generally occurs between 4,000 and 7,000 feet in elevation, where annual precipitation averages from 12 to 16 inches. Chaparral provides significant forage and cover. Associated plants are mountain mahogany, shrub live oak, desert ceanothus, cliffrose, manzanita, skunkbush, shrubby buckwheat, and desert needlegrass.

Creosotebush

The creosotebush type occupies 20 percent (170,017 acres) of the public lands in the EIS area. It primarily occurs from 1,000 to 3,000 feet in elevation, where annual precipitation averages from 4 to 10 inches. The creosotebush type produces little perennial forage but provides a large portion of the EIS area's ephemeral forage. Associated plants are white bursage, Mohave yucca, ratany, and wolfberry.

Desert Shrub

Desert shrub is the EIS area's most common vegetation type, covering 26 percent (224,385 acres) of the public lands in the EIS area. It represents a unique type: a transition between the Mohave and Sonoran deserts. It occurs between 3,000 and 5,000 feet in elevation in the 8 to 14 inch precipitation zone, generally between the

TABLE 3-1
CHARACTERISTICS OF VEGETATION TYPES

Vegetation Types	Acres	Percent EIS Area	Key Species Comp. (Av. (Percent)	Usable Forage Production Pounds/Ac.	Rangeland Condition (Acres)				Apparent Rangeland Trend (Acres)			Cover Percent	Elevation (Feet)	Annual Precipitation (Inches)
					Poor	Fair	Good	Excellent	Up	Static	Down			
Chaparral	81,486	9	26	184	8,398	44,712	26,194	2,182	7,826	69,506	4,154	44	4,000-7,000	12-16
Creosotebush	170,017	20	7	72	24,974	112,300	28,824	3,919	24,079	131,785	14,153	14	1,000-3,000	4-10
Desert Shrub	224,385	26	17	128	22,027	101,836	91,521	9,001	21,341	173,872	29,172	26	3,000-5,000	8-14
Grassland	68,988	8	32	157	2,064	26,616	40,079	229	20,958	36,654	11,376	18	4,000-6,000	10-16
Joshua Tree	21,426	3	22	116	11,131	975	4,011	5,309	0	21,426	0	19	2,000-3,000	8-10
Paloverde	194,298	22		96	16,796	125,682	51,736	84	15,276	142,458	36,564	18	1,000-3,000	4-12
Pinyon-Juniper	86,995	10		118	708	47,898	38,389	0	2,372	75,005	9,618	22	4,000-6,000	10-16
Ponderosa Pine	4,350	< 1	3	41	0	4,350	0	0	0	4,350	0	34	> 6,000	16-20
Riparian	4,804	< 1		165	2,905	1,862	37	0	0	2,388	2,416	26	Varies	Varies
Total	856,749				89,003	466,231	280,791	20,724	91,852	657,444	107,453			

chaparral type above and the creosotebush and paloverde types below. Associated plants are flattop buckwheat, Mohave thorn, prickly pear cactus, snakeweed, brittlebush, twinberry, ratany, and globemallow.

Grassland

The grassland type covers 8 percent (68,988 acres) of the public lands in the EIS area. It occurs primarily in valleys and on mesa tops between 4,000 and 6,000 feet in elevation, where annual precipitation averages 10 to 16 inches. It is one of the most important types for forage production. Associated plants include big galleta, tobosa, black grama, squirreltail, blue grama, hairy grama, snakeweed, and catclaw.

Joshua Tree

The Joshua tree type covers 3 percent (21,426 acres) of the public lands in the EIS area. It is found between 2,000 and 3,000 feet in elevation, where annual precipitation averages from 8 to 10 inches. Associated plants include creosotebush, white bursage, buckhorn cholla, big galleta, and bush muhly.

Paloverde

Paloverde is the EIS area's second most common vegetation type, occupying 22 percent (194,298 acres) of the EIS area's public lands. Paloverde largely occurs in the southern EIS area around Big Sandy Wash and Alamo Lake, between 1,000 and 3,000 feet in elevation, where annual precipitation averages 4 to 12 inches. This type produces little perennial forage but produces abundant ephemeral forage under favorable climatic conditions. Associated plants are saguaro, creosotebush, ocotillo, wolfberry, big galleta, and bush muhly.

Pinyon-Juniper

The pinyon-juniper type is found on 10 percent (86,995 acres) of the public lands in the EIS area. It generally occurs on west-facing slopes between 4,000 and 6,000 feet, where annual precipitation averages from 10 to 16 inches. This type is associated with desert ceanothus, shrub live oak, squirreltail, and black grama.

Ponderosa Pine

The ponderosa pine is the least extensive vegetation type of the public lands in the EIS area, occupying less than 1 percent (4,350 acres). It occurs in the Hualapai Mountains above 6,000 feet, where annual precipitation averages 16 to 20 inches. Associated plants include Douglas fir, manzanita, Gambel oak, goldenrod, and muttongrass.

Black Grama

Riparian Vegetation

Riparian vegetation covers less than 1 percent (4,804 acres) of the public lands in the EIS area. It grows along streambanks and water bodies and around springs and seeps (Map 2-1). Associated plants include cottonwood, willow, ash, desert willow, mesquite, and saltcedar.

Riparian communities in good condition have an abundant and diverse assortment of plants and animals. In healthy communities age distribution is good, the soil is mostly covered with vegetation, little bank erosion occurs, and vegetation shades the water and provides cover for animals.

Riparian areas are invaluable to wildlife, burros, and livestock, supplying water, cover, and forage. They are usually grazed more heavily than are upland zones (Platts, 1979).

EPHEMERAL VEGETATION

Ephemeral (annual) vegetation occurs throughout most of the EIS area below 4,000 feet. Desert ephemerals germinate rapidly and mature early under the proper combination of favorable temperature and adequate moisture. The life cycle of many species lasts only from 5 to 6 weeks (Shreve, 1942). Annuals such as filaree, Indian wheat, and Mediterranean grass provide most of the EIS area's ephemeral forage (BLM, 1980a).

PHENOLOGY

An important consideration in managing rangeland is the phenological stage during which a plant is grazed. Knowledge of the phenological stages of key forage plants is necessary for developing grazing systems that provide for the physiological needs of those plants. Table 3-2 shows the phenological developmental stages for selected key species in the EIS area. The dates, however, represent an average, since much of the southwest desert flora is opportunistic, growing and reproducing at any time of the year under suitable temperature and moisture conditions (BLM, 1980a). Other key species that may be monitored but for which we now have no phenological data include western wheatgrass, little bluestem, cane bluestem, tobosa grass, Indian ricegrass, muttongrass, New Mexico feathergrass, desert stipa, curly mesquite, cottontop, hairy grama, spike dropseed, sand dropseed, globemallow, range ratany, desert ceanothus, mountain mahogany, and cliffrose. Percent key species composition by vegetation type is shown on Table 3-1.

TABLE 3-2
PHENOLOGICAL DEVELOPMENT OF SELECTED KEY SPECIES

Plant	Developmental Stages (Average Dates)			
	Start Growth	Flower	Seed Ripe	Dormancy
Black Grama	July	August	September	October
Blue Grama	July	August	September	October
Sideoats Grama	July	August	September	October
Squirrel Tail	March	April	May	June
Junegrass	March	April	May	June
Blue-bunch Wheatgrass	March	April	May	June
Big Galleta	July	August	September	October
Bush Muhly	July	August	September	October
Ephedra spp.	March	May	June	December
Desert Rock Pea	March	April	June	December
Shrubby Buckwheat	March	May	June	November
Mexican Bladdersage	March	April	June	December
Twinberry	March	May	June	December
Short-leaf Baccharis	March	April	May	December
White Ratany	March	April	June	December

Source: BLM, 1980a;b.

RANGELAND CONDITION

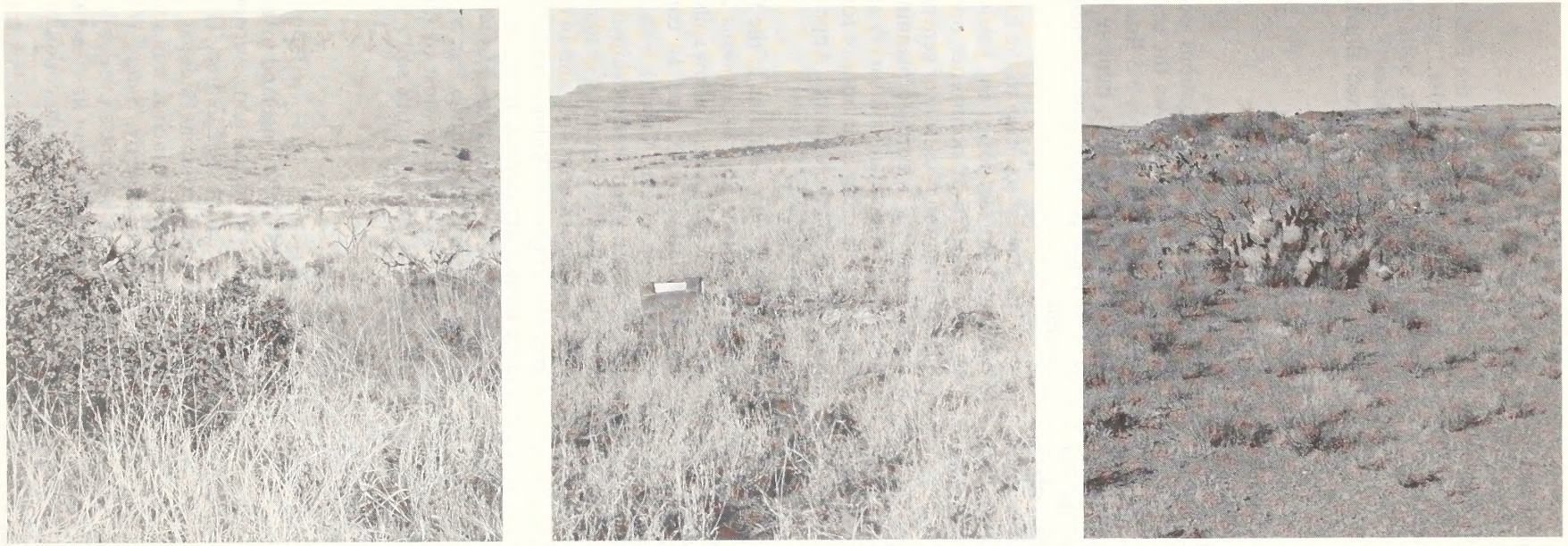
The rangeland condition classification was based on a comparison of the existing plant species composition on a range site with its presumed climax composition as specified by the range site guides. The methodology for determining rangeland condition is described in Appendix 1-1. Table 3-1 shows rangeland condition and usable forage production for each vegetation type as determined from the rangeland inventory. Rangeland condition acreage by allotment is shown in Appendix 3-1.

APPARENT RANGELAND TREND

Rangeland trend is the direction of change in rangeland condition. The present ecological rangeland condition rating alone does not show whether the plant community is improving or deteriorating in relation to its potential. Trend is a separate determination necessary for assessing what is happening to the plant community. The present rangeland condition is a result of a sustained trend over time. Trend is a much more sensitive indicator of change than condition.

Rangeland trend is developed from data collected over a period of time. Since trend studies have not been established within the EIS area, apparent rangeland trend was determined during the rangeland inventory conducted during 1978 and 1979. Methodology for determining apparent rangeland trend is found in Appendix 1-1.

The apparent rangeland trend information represents only a single year's observations, and it thus may not reflect the actual long-term trend of an area. Apparent trend was determined and used for analysis only. Information obtained from apparent range trend shows



Rangeland Condition Varies on Similar Range Sites

Rangeland condition is determined by comparing the vegetation supported by similar soils, known as range sites. The left photo shows an area that has not been grazed by livestock. Supporting many species of forage plants, including over 10 species of perennial grasses, this site is in excellent condition. The middle photo shows an area of the same range site but in good condition. This area still has many good forage plants and grasses, but production is lower and there are fewer species of grass. The right photo shows an area in the same range site in poor condition. There are few forage plants, almost no grasses, and less forage production than in areas in better condition. Poisonous plants (snakeweed) are also invading and taking over the site.

91,852 acres of public land (11 percent) in an upward trend, 657,444 acres (77 percent) with no apparent trend, and 107,453 acres (12 percent) in a downward trend. Apparent rangeland trend for each vegetation type is shown in Table 3-1 and for each allotment in Appendix 3-1.

PROTECTED PLANTS

Several plants growing on public land in the EIS area were proposed as protected plants by the Smithsonian Institution in the *Federal Register* on July 1, 1975, revised, and again published in the *Federal Register* on June 16, 1976. A final listing of protected plants, however, has not been published, and, as required by recent amendments to the Endangered Species Act of 1973, all proposed protected plants were dropped from the list. This EIS thus does not discuss all the EIS area's plants listed by the Smithsonian. Rather, it discusses seven plants that BLM in Arizona has proposed for the Fish and Wildlife Service's final listing of protected plants (Table 3-3).

In addition, the Arizona Natural Heritage Program (see Glossary) has compiled a list of potentially sensitive species. Five species on this list occur within the EIS area and also appear on Table 3-3.

Sophora arizonica, Stillingia linearifolia, Tetracoccus fasciculatus var. *hallii,* and *Allium bigelovii* either have strong tolerances for grazing or are located in areas inaccessible to grazing animals. These plants are thus not expected to be impacted by grazing and are not discussed in detail. *Cowania subintegra* is a preferred browse plant, and the remaining plants may be potentially impacted by grazing due to trampling and to a smaller extent browsing.

TABLE 3-3
PROTECTED PLANTS

Scientific Name	Proposed Status[1]	Listed by BLM	Listed by Arizona Natural Heritage Program
Allium bigelovi	S		X
Amsonia palmeri	S	X	
Castilleja stenantha	S		X
Coryphantha vivipara var. buoflama	E	X	
Cowania subintegra	T	X	
Opuntia curvospina	S	X	
Opuntia littoralis var. martiniana	S	X	
Opuntia pulchella	S	X	
Orobanche uniflora ssp. occidentalis	S		X
Sophora arizonica	S	X	
Stillingia linearifolia	S		X
Tetracoccus fasciculatus var. hallii	S		X

[1] E = Endangered; T = Threatened; S = Sensitive. For definitions, see Glossary.

SOILS

Fifty-five percent of the EIS area has soils formed in residuum from granite, granite-gneiss, rhyolite-andesite, schist, and basalt. Soils formed in basalt occur primarily on Goodwin, Bozarth, and Black Mesas. Alluvial soils formed in mixed alluvium occupy about 45 percent of the EIS area.

SOIL ASSOCIATIONS

Fourteen soil associations occur in the EIS area (Plate 2). Table 3-4 shows the acreage of each association by allotment. Table 3-5 lists the acreage and percent of each association, limiting factors, and physical and chemical properties of individual soils in each association.

The general soil map of the EIS area (Plate 2) does not show the exact soil at any particular place but rather shows a pattern of occurrence on defined landscapes. The information is useful for general planning but is not suitable for use in detailed planning and specific interpretations. A detailed soil survey exists for most of the Aquarius Planning Unit but not for the Hualapai Planning Unit (Mohave County). Appendix 3-2 classifies the soil series of the EIS area.

Several soil conditions in the EIS area restrict forage production. Soil associations 2, 6, 10, 11, and 13 have very steep slopes, shallow soils, and rock outcrops. Soil associations 1, 5, and 14 contain large areas of shallow soils (Cave, Cavelt) with hard limepans. The soil-moisture plant relationship is poor on these soils even during years of normal or above-normal precipitation. Soil associations 4, 5, and 14 contain large areas of gravelly, limy soils (Rillino and Rillito soils), which produce limited amounts of forage during favorable years. Soil association 10 contains a frigid soil, Frees Bouldery Loam, which occurs in the Hualapai Mountains above 6,000 feet in elevation. Most of the ponderosa pine in the EIS area occurs on this soil.

EROSION

The 1978–1979 rangeland inventory identified several locations in critical and severe erosion classes, totalling 1.4 percent of the EIS area. The largest area, which is near Wikieup, contains Badland, a miscellaneous land type occurring as an inclusion in soil association 4. Portions of the Big Sandy, Sandy, Wikieup, Gray Wash, Hot Springs, and Francis Creek allotments occur in this area, and each allotment has several hundred acres in a critical and severe erosion condition.

The Bagdad allotment has small areas of critical and severe erosion condition, mostly next to Burro

TABLE 3-4
SOIL ASSOCIATION ACREAGE BY ALLOTMENT

Allotment	Soil Association													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Alamo Crossing	--	3,429	--	--	--	--	--	--	--	--	--	--	--	11,520
Arrastra Mountain	--	--	--	2,190	--	22,332	--	--	1,223	--	--	--	--	--
Artillery Range	--	--	37,885	--	--	41,506	--	--	9,090	--	--	--	--	--
Bagdad	--	--	--	8,967	--	23,283	--	--	3,970	--	3,530	--	--	--
Bateman Spring	7,938	4,671	5,687	--	--	7,220	476	--	2,437	--	--	--	--	--
Big Sandy	350	--	4,734	41,452	--	20,393	5,492	--	6,550	9,435	--	--	--	--
Black Mesa	--	--	--	2,352	--	4,760	--	--	542	--	--	--	--	--
Boriana	--	--	2,940	--	20,041	12,174	--	--	3,047	13,913	--	--	--	--
Bottleneck Wash	--	--	--	--	--	--	--	34	--	100	--	--	--	--
Burro Creek	--	--	--	--	--	4,770	--	--	--	--	--	--	1,291	--
Burro Creek Ranch	--	--	--	11,287	--	24,396	1,365	--	1,615	--	--	--	--	--
Byner	--	--	--	--	--	3,017	--	--	--	--	--	270	440	--
Cane Springs Wash	--	--	--	1,368	--	--	--	--	152	--	--	--	--	--
Chicken Springs	19,345	2,275	67,773	--	--	40,002	--	--	7,207	--	--	--	--	--
Chino Springs	--	--	1,213	3,698	--	14,235	--	--	--	--	--	--	--	--
Diamond Joe	--	--	1,186	4,127	--	3,089	3,963	--	2,435	8,133	--	--	--	--
DOR	--	--	--	1,300	--	310	--	--	--	930	--	--	--	--
Fancher Mountain	--	--	--	1,570	--	1,215	--	--	365	--	--	--	--	--
Francis Creek	--	--	--	12,134	--	42,203	--	--	890	32,447	--	22,767	--	--
Gibson	--	--	--	7,722	--	20,418	1,515	--	3,775	--	--	--	--	--
Gray Wash	--	--	--	8,684	--	6,512	--	--	1,780	--	--	--	--	--
Greenwood Community	--	--	7,986	--	--	13,315	902	--	978	--	--	--	--	--
Greenwood Pk. Community	--	--	--	20,240	--	23,250	--	--	4,775	--	--	--	--	--
Groom Peak	--	--	--	1,323	--	5,224	285	--	239	--	--	--	--	--
Happy Jack Wash	6,605	--	3,149	--	22,812	5,747	--	--	3,170	--	--	--	--	--
Hot Springs	--	--	--	1,131	--	--	--	--	127	--	--	--	--	--
Hualapai Peak	--	--	--	--	--	10,242	--	308	--	2,460	--	--	--	--
JJJ	--	--	--	--	--	303	--	--	--	--	--	--	--	--
Kayser Wash	--	--	--	--	--	640	--	--	--	--	--	--	--	--
Kellis	--	--	--	--	--	--	--	--	--	--	--	--	1,467	--
Kent's Cane Springs	--	--	--	--	--	--	--	595	--	31,622	--	--	--	--
La Cienega	95,331	--	28,165	--	--	29,910	--	--	5,790	16,400	--	--	--	--
Lazy YU	--	--	3,630	--	7,570	7,818	--	--	660	3,805	--	--	--	--
Lines	--	--	--	5,473	--	15,985	160	--	105	--	1,340	--	--	--
Little Cane	--	--	1,570	2,391	--	--	--	1,605	472	--	--	--	--	--
Los Molinos	--	--	--	1,713	--	16,257	680	--	986	--	--	--	--	--
McElhaney	--	--	--	--	--	--	--	--	--	--	--	5,185	3,995	--
Round Valley	--	--	--	544	--	64	--	--	32	--	--	--	--	--
Sandy	--	--	--	810	--	--	--	--	--	341	--	--	--	--
Sweetmilk	--	--	--	--	1,674	--	--	--	--	648	--	1,328	--	--
Trout Creek	--	--	--	--	--	640	--	--	--	--	--	--	--	--
Walnut Creek	--	--	6,610	--	21,340	29,040	--	--	1,620	25,981	--	--	--	--
White Spring	--	--	--	881	--	218	--	--	286	--	--	--	--	--
Wikieup	--	--	--	6,118	--	4,476	--	--	376	--	--	--	--	--
Yellow Pine	--	--	--	--	--	--	3,740	--	--	35,928	--	--	--	--
TOTAL	129,219	10,375	172,528	147,475	73,437	454,964	18,578	2,542	64,694	182,143	4,870	29,550	7,193	11,520

TABLE 3-5
PHYSICAL AND CHEMICAL PROPERTIES OF SOIL ASSOCIATIONS

No.	Soil Association Name[1]	Percent of EIS Area	Acres in EIS Area	Slope Percent	Dominant Soil Texture[3]	Depth to Bedrock or Hardpan (inches)	Permeability (inches/hour)	Annual Precipitation (inches)	Annual Frost-Free Days	Drainage	Soil Reaction pH[4]	Hydrologic Soil Group[5]	Erosion Hazard[6]	Important Soil Features[7]
1	Hayhook (Variant) Cave Association	9.9	129,219											
	Hayhook (Var)-60 percent			0-5	Gravelly Sandy Loam	60	2.0-6.0	8-12	180-270	Well	7.9-8.4	B	Slight	Calcareous
	Cave-25 percent			2-25	Gravelly Sandy Loam	4-20	0.6-2.0	8-12	180-270	Well	7.9-8.4	D	Slight	Shallow soil depth, high lime, gravelly
	Inclusions-15 percent[2]													
2	Schenco-Lomitas-Rock Outcrop Association	0.79	10,375											
	Schenco-50 percent			3-60	Very Channery Loam	7-20+	0.6-2.0	5-10	250-300	Well	7.9-8.4	D	Slight	Shallow to moderate soil depth, channery, steep slopes
	Lomitas-30 percent			3-60	Very Gravelly Loam	12-20	0.6-2.0	5-10	250-300	Well	7.9-8.4	D	Slight	Shallow soil depth, gravelly, steep slopes
	Rock Outcrop-10 percent[2]			15-60								D		Bedrock outcrops
	Inclusions-10 percent[2]													
3	Cave-Hayhook-Continental Association	13.2	172,528											
	Cave-60 percent			2-25	Gravelly Sandy Loam	4-20	0.6-2.0	8-12	180-270	Well	7.9-8.4	D	Slight	Shallow soil depth, high lime, gravelly
	Hayhook-15 percent			0-5	Sandy Loam	60	2.0-6.0	8-12	220-270	Well	6.6-8.4	B	Slight	No limitations
	Continental-10 percent			2-15	Gravelly Clay	60	0.06-0.2	8-12	170-250	Well	7.4-8.4	C	Slight	Shrink-swell, clayey, gravelly
	Inclusions-15 percent[2]													
4	Cave-Rillino-Continental Association	11.3	147,475											
	Cave-45 percent			2-25	Gravelly Sandy Loam	4-20	0.6-2.0	8-12	180-270	Well	7.9-8.4	D	Slight	Shallow soil depth, high lime, gravelly
	Rillino-40 percent			2-40	Gravelly Sandy Loam	60	0.6-2.0	8-12	220-265	Well	7.9-8.4	B	Slight	High lime, gravelly, steep slopes
	Continental-5 percent			2-15	Gravelly Clay	60	0.06-0.2	8-12	170-250	Well	7.9-8.4	C	Slight	Shrink-swell, clayey, gravelly
	Inclusions-15 percent[2]													
5	Cave-Rillino Association	5.6	73,437											
	Cave-75 percent			2-25	Gravelly Sandy Loam	4-20	0.6-2.0	8-12	180-270	Well	7.9-8.4	D	Slight	Shallow soil, high lime, gravelly
	Rillino-10 percent			2-40	Gravelly Sandy Loam	60	0.6-2.0	8-12	220-265	Well	7.9-8.4	B	Slight	High lime, gravelly, steep slopes
	Inclusions-15 percent[2]													
6	Cellar-House Mountain-Rock Outcrop Association	34.72	454,464											
	Cellar-40 percent			5-60	Cobbly Sandy Loam	4-20	0.6-2.0	8-12	180-270	Well	6.6-8.4	D	Slight	Shallow soil depth, cobbly soil, steep slopes
	House Mountain-30 percent			5-60	Stony Loam	4-20	0.6-2.0	8-12	180-270	Well	7.4-8.4	D	Moderate	Shallow soil depth, stony, steep slopes
	Rock Outcrop-15 percent			15-60								D		Bedrock outcrop
	Inclusions-15 percent[2]													
7	Eba-Continental Association	1.4	18,578											
	Eba-50 percent			3-45	Very Gravelly Clay	60	0.06-0.2	8-14	160-215	Well	6.6-7.8	C	Slight	Clayey, gravelly, steep slopes
	Continental-40 percent			2-15	Gravelly Clay	60	0.06-0.2	8-12	170-250	Well	7.4-8.4	C	Slight	Clayey, shrink-swell, gravelly
	Inclusions-10 percent[2]													
8	Lonti-Pastura-Abra Association	0.19	2,542											
	Lonti-80 percent			2-25	Gravelly Clay	60	0.06-0.2	12-16	140-200	Well	6.6-8.4	C	Moderate	Clayey, shrink-swell, gravelly
	Pastura-15 percent			2-25	Gravelly Loam	7-20	0.6-2.0	12-16	130-170	Well	7.9-8.4	D	Moderate	Shallow soil depths, high lime, gravelly
	Abra-5 percent			2-25	Loam	60	0.6-2.0	12-16	145-185	Well	7.9-8.4	C	High	High lime

TABLE 3-5 (Continued)
PHYSICAL AND CHEMICAL PROPERTIES OF SOIL ASSOCIATIONS

No.	Soil Association Name[1]	Percent of EIS Area	Acres in EIS Area	Slope Percent	Dominant Soil Texture[3]	Depth to Bedrock or Hardpan (inches)	Permeability (inches/hour)	Annual Precipitation (inches)	Annual Frost-Free Days	Drainage	Soil Reaction pH[4]	Hydrologic Soil Group[5]	Erosion Hazard[6]	Important Soil Features[7]
9	Arizo-Anthony-Latene Association	4.9	64,694											
	Arizo-60 percent			0-3	Gravelly Sand	60	> 20.0	8-12	200-260	Excessive	7.4-9.0	A	Slight	Subject to flooding, gravelly
	Anthony-30 percent			0-5	Gravelly Sandy Loam	60	2.0-6.0	8-12	180-270	Well	7.9-8.4	B	Slight	Subject to flooding, gravelly
	Latene-5 percent			0-5	Loam	60	0.6-2.0	8-12	170-210	Well	7.9-8.4	B	High	High lime
	Inclusions-5 percent[2]													
10	Faraway-Frees-Rock Outcrop Association	13.9	182,143											
	Faraway-65 percent			15-60	Stony Loam	4-20	2.0-6.0	12-18	140-220	Well	5.6-7.3	C	Moderate	Shallow soil depth, stony, steep slopes
	Frees-10 percent			3-60	Bouldery Loam	4-20	0.6-2.0	18-24	80-150	Well	5.1-5.5	D	Slight	Shallow soil depth, bouldery, steep slopes
	Rock Outcrop-15 percent[2]			5-60								D		Bedrock outcrops
	Inclusions-10 percent[2]													
11	Luzena-Faraway-Rock Outcrop Association	0.40	4,870											
	Luzena-45 percent			5-45	Gravelly Clay	4-20	0.06-0.2	12-18	160-250	Well	6.1-7.3	D	Moderate	Shallow soil depth, shrink-swell, gravelly, steep slopes
	Faraway-35 percent			5-45	Very Gravelly Sandy Loam	4-20	0.6-2.0	12-18	160-250	Well	5.6-7.3	D	Moderate	Shallow soil depth, gravelly, steep slopes
	Rock Outcrop-15 percent[2]			15-60								D		Bedrock outcrops
	Inclusions-5 percent[2]													
12	Springerville-Cabezon-Thunderbird-Rock Outcrop Association	2.3	29,550											
	Springerville-30 percent			0-8	Stony Silty Clay	20-40	< 0.06	16-18	115-160	Well	7.4-7.8	D	Slight	Moderate soil depth, shrink-swell, stony
	Cabezon-25 percent			8-25	Cobbly Clay	10-20	0.06-0.2	16-18	118-210	Well	6.6-7.8	D	Slight	Shallow soil depth, shrink-swell
	Thunderbird-25 percent			2-15	Clay	20-40	< 0.06	16-18	115-170	Well	7.9-8.4	D	Moderate	Moderate soil depth, shrink-swell
	Rock Outcrop-5 percent[2]			5-60								D		Bedrock outcrops
	Inclusions-15 percent[2]													
13	Barkerville-Gaddes-Rock Outcrop Association	0.50	7,193											
	Barkerville-50 percent			3-60	Very Gravelly Sandy Loam	20-40	2.0-6.0	12-20	140-220	Well	6.1-7.8	C	Slight	Moderate Soil depth, gravelly, steep slopes
	Gaddes-30 percent			5-30	Gravelly Sandy Clay Loam	20-40	0.06-0.2	12-20	140-170	Well	6.1-7.3	C	Slight	Moderate soil depth, gravelly
	Rock Outcrop-15 percent[2]			5-60								D		Bedrock outcrops
	Inclusions-5 percent[2]													
14	Cavelt-Rillito Association	0.90	11,520											
	Cavelt-45 percent			0-15	Gravelly Sandy Loam	4-20	0.6-2.0	5-10	250-300	Well	7.9-8.4	D	Slight	Shallow soil depth, high lime, gravelly
	Rillito-40 percent			0-15	Gravelly Sandy Loam	60	0.6-2.0	5-10	250-300	Well	7.9-8.4	B	Slight	High lime, gravelly
	Inclusions-15 percent[2]													

SOURCE: U.S. Department of Agriculture, Soil Conservation Service, General Soil Map and Interpretations, Mohave County 1974; Soil Survey of Yavapai County, Western part 1976 and modified by the SVIM Inventory 1978-1979

[1] See Appendix 3-2 for official soil series classification.
[2] Properties too variable to be estimated.
[3] General profile texture based on defined characteristics of the soil.
[4] Reaction description - pH range (see glossary for description of soil reaction).
Strongly acid = 5.1-5.5; Medium = 5.6-6.0; Slightly acid = 6.1-6.5; Neutral = 6.6-7.3; Mildly alkaline = 7.4-7.8; Moderately alkaline = 7.9-8.4.
[5] Hydrologic Soil Groups: A = Low runoff potential; B = Moderately low runoff potential; C = Moderately high runoff potential; D = High runoff potential.
[6] Erosion hazard is an estimate of the susceptibility or potential of a soil to erode.
[7] Features listed are those that have a major influence on soil use and management.

Creek. Bentonite mining and fragile soils (Typic Torriorthents) are the major factors affecting the erosion condition on this allotment.

The Alamo Crossing, Chino Springs, and Chicken Springs allotments have small areas of critical and severe erosion on dissected alluvial fans. Most of the critical and severe erosion in this allotment occurs in the Rillito soil series in soil association 14. Wild burro and livestock trails and trampling are major factors affecting the erosion condition on this allotment.

Riparian zones, especially along Burro, Conger, and Trout Creeks and the Santa Maria River, have several small areas of moderate and critical erosion along streambanks and in flood plains. Erosion in these areas is aggravated by heavy grazing pressure from livestock, wild burros, and wildlife attracted by water, shade, and palatable vegetation.

Table 3-6 shows erosion condition classes by acreage within the EIS area. Erosion hazard for each soil series is shown on Table 3-5.

TABLE 3-6
EROSION CONDITION CLASS

Erosion Condition	Federal Acres	Non-Federal Acres	Percent of EIS Area
Slight[1]	749,842	369,439	86.5
Moderate	97,523	74,000	13.1
Severe[2]	9,384	8,400	1.4
Total	856,749	451,839	100.0

[1] Stable erosion class was combined with slight because of the small acreage involved.
[2] Critical erosion class was combined with severe because of the small acreage involved.

Severe Erosion May Accompany Loss of Vegetation on Fragile Soils

Fragile soils do not respond well to loss of vegetation cover or to soil disturbance resulting from trampling, trailing, or other activities. When protective plant cover is depleted, the bare soil cannot withstand the impacts of wind and sudden thunderstorms. As the soil on this site erodes, thousands of years of soil-forming processes are lost along with resources dependent on the soil. Four alternatives would reduce soil erosion by restoring vegetation cover and reducing soil disturbance.

SEDIMENT YIELD

Sediment yield for the EIS area's soil associations is as follows.

Soil Association	Existing Sediment Yield Ac. Ft./M^2/Year
1	0.33
2	0.37
3	0.36
4	0.28
5	0.31
6	0.34
7	0.33
8	0.34
9	0.30
10	0.35
11	0.26
12	0.24
13	0.24
14	0.33
Weighted Average	0.33

All the soil associations in the area have sediment yields classified as slight, from 0.2 to 0.5 acre-feet/square mile/year. The EIS area's weighted average sediment yield is calculated to be 0.33 acre-feet/square mile/year. Although sediment yield for different soil associations can be compared, actual sediment removed from the EIS area cannot be reliably calculated, because sediment yield estimates are unconfirmed by field measurements. Data used to calculate sediment yield were obtained from existing soil (SCS, 1976b; BLM, 1979a;b) and watershed (BLM, 1974–1975) inventories. Appendix 3-3 discusses the methodology for estimating sediment yield.

WATER RESOURCES

GROUND WATER

The most important aquifers in this EIS area are the valley and fan deposits of alluvial fill. Major aquifers are located in the Sacramento and Big Sandy Valleys. Other sources of ground water are wells along fractures in crystalline and metamorphic rocks. Most of the ground water used by grazing animals comes from wells tapping fractures in bedrock or small alluvial deposits in washes. These wells yield less than 10 gallons per minute.

SURFACE WATER

Five watersheds, all in the lower Colorado River Basin, drain the EIS area: Sacramento Wash, Burro Creek, and the Big Sandy, lower Bill Williams, and Santa Maria Rivers. Perennial streams in the Big Sandy and Burro Creek watersheds provide instream water for grazing animals. Many small stock ponds and springs supplement the perennial streams.

Streamflow in the area is highly variable. Peak flows occur from October through March and in July and August. Streamflow directly results from rainfall runoff; little of the stream baseflow results from snowmelt.

WATER QUANTITY

Grazing animals consume relatively small amounts of water, and water supply problems in grazing management are related more to distribution than to adequacy of supply. Annual water consumption requirements for livestock, big game, and wild burros in the EIS area amount to 4, 30, and 5 acre-feet respectively, totaling 39 acre-feet. This amount is provided by waters on Federal, State, and private lands. The portion of the total water demand provided from Federal land is not known.

Surface water yields for the Big Sandy, Burro Creek, and Santa Maria watersheds average more than 70,000 acre-feet/year. Available ground water in storage is estimated at 13,000,000 acre-feet for the Big Sandy Valley aquifer and 6,500,000 acre-feet for the Sacramento Valley aquifer.

Nonconsumptive uses of water cannot presently be quantified. These uses include riparian vegetation, aquatic wildlife habitat, and water-associated recreation, including body-contact activities, fishing, and hunting.

WATER QUALITY

Ground Water

Total dissolved solids (TDS) for the area's ground water range from 230 to 2,540 milligrams/liter. Average TDS is 624 milligrams/liter. Ground water in the area is suitable for irrigation and livestock water, but its fluoride content generally exceeds maximum allowable concentrations for public water supplies.

Surface Water

Total dissolved solids (TDS) for the area's streams average from 308 to 1,139 milligrams/liter. Water is

suitable for livestock and wildlife consumption except at Burro Creek Campground, where the amount of fecal coliform and total lead exceeds maximum allowable concentrations. No location sampled met all recreation and wildlife standards for dissolved oxygen, fecal coliform, dissolved copper, ammonia, lead, and organic nitrogen. None of the sampled streams could provide water suitable for domestic use.

Water contaminants most associated with grazing are fecal coliform, sediment, and nutrients. Fecal coliform violated standards in only one of eight sampled locations in the area. Suspended sediment in the area's streams averages from 0.009 to 1.95 acre-feet/square mile/year. Nutrient pollutants include nitrogen, phosphorus, and organic compounds. These pollutants result from animal contact or are introduced to the stream as part of the sediment.

WILDLIFE

The Hualapai-Aquarius Planning Area is the most diverse biotic area of its size on public lands in Arizona. Wildlife habitat inventories revealed 20 kinds of habitats, both aquatic and terrestrial, ranging from the fir-aspen forests of Hualapai Peak to the creosotebush flats near Yucca and the lush broadlead riparian habitat of Francis Creek.

Such a variety of habitats has resulted in a wealth of wildlife inhabitants—over 390 species in the area. One species, the Hualapai Mountain vole *(Microtus mexicanus hualapaiensis),* occurs nowhere else in the world (Cockrum, 1960).

The great diversity of habitats affords use by more species of raptors (birds of prey) than any other public land administered by BLM (Millsap, 1979).

Key wildlife species, federally listed, State protected, unique, or of high economic value, are discussed individually if they are expected to be significantly impacted by the proposed action or alternatives. Species have been grouped together if agents are expected to impact members of the group similarly. The focus will be on habitat factors that support wildlife—food, cover, water, and space.

Little population status and trend data exists for animals other than big game in the planning area, but habitat condition is fairly well known (Hall, 1980; Jones, 1979a).

BIG GAME

Elk

Rocky Mountain elk most of the year occupy parts of the pinyon-juniper and ponderosa pine vegetation types in the Yellow Pine and Hualapai Peak allotments. An estimated 16 elk occupy 7,000 acres of crucial habitat on public lands in the planning area (Map 2-3). Elk habitat in the area is of low quality, the decline in habitat resulting from private development in adjacent nonpublic lands, lack of adequate forage on public lands, and competition with livestock for living space.

Many authors have determined that elk compete more closely with cattle for forage than any other herbivores in the planning area (Wagner, 1978; Kufeld, 1973; Boyd, 1970). Grass makes up a major portion of elk diets, and browse is important in winter. Grass has been severely depleted in both allotments, and cliffrose, a key browse plant in Yellow Pine allotment, shows signs of severe overuse where cattle, elk, and deer occur (BLM, 1980b).

Elk can be displaced by livestock through competition for space (Jeffrey, 1963; Mackie, 1970). This condition may be severe, considering excess stocking, limited waters, fences restricting movement, and the few acres of suitable habitat available. The apparent population trend is down.

Mule Deer

An estimated 2,687 mule deer occupy yearlong all 856,749 acres in the EIS area (BLM, 1980a;b). Highest densities occur in the Hualapai Mountains and the Aquarius Cliffs areas. Preferred habitat is in the ponderosa pine, chaparral, pinyon-juniper, and desert shrub vegetation types. Mule deer sparsely populate the creosotebush, paloverde, Joshua tree, and grassland vegetation types. Populations have been declining since the late 1960s.

Habitat conditions for deer vary throughout the planning area. Cover is adequate throughout, but food, water, and space are limiting factors in different allotments.

Deer compete closely for forage with cattle and burros. The greatest competition occurs between deer and cattle on allotments depleted of grass, where cattle have turned to browse as a major part of their diet. This condition is evident in preferred deer habitat in the foothills of the Hualapai Mountains and the lower Aquarius Cliffs area (Hawkes and Furlow, 1978). Deer and cattle compete heavily throughout deer habitat under 2,500 feet in elevation. Key species for deer in these competitive areas (globemallow, Mormon tea, mountain mahogany, desert ceanothus, and shrubby buckwheat) are often grazed beyond proper use.

Burros compete with deer in the paloverde habitat of nine allotments next to Burro Creek and the Big Sandy and Santa Maria Rivers, using much the same forage as deer (BLM, 1980b). Fire in the chaparral vegetation type often results in better browse production for deer.

The presence of water influences the distribution of mule deer. Many areas lack water, limiting deer use mainly to the south half and the west fourth of the planning area. Lack of water decreases the amount of rangeland available to deer and restricts population growth.

Livestock waters may benefit deer, but fences or corrals often restrict access to water, especially in the southern and eastern slopes of the Hualapai Mountains. Fencing restricts free movement of deer, and unmaintained fences are likely to cause deer deaths by entanglement in downed or loose wire.

Burros compete with deer for space in the southern part of the planning area, displacing deer around waters and upsetting deer use patterns (Farrell, 1973), especially in the Rawhide Mountains.

Pronghorn Antelope

Eighty-one pronghorn antelope occupy 33,000 acres of crucial habitat on public lands on the grasslands of Goodwin and Bozarth Mesas (Map 2-3). Most antelope occur on Francis Creek allotment (Goodwin Mesa), where the fair-to-good condition of grassland vegetation makes the habitat better than on the Bozarth Mesa allotments.

Forage is limited in the grassland habitat, which has relatively few palatable perennial forbs—the major part of pronghorn diets. The few grassland areas in good-to-excellent condition have more forbs than does grassland in poorer condition. Cattle, however, eat less forbs than grass. Some fires on these mesas have resulted in more grass and forb production beneficial to pronghorn (BLM, 1980a).

Water is fairly well distributed on Goodwin Mesa but less so on Bozarth Mesa. The main problem for pronghorn is obtaining water year-long. The major water sources are earthen reservoirs, which may dry up during some months (Yoakum, 1975).

Cover also limits pronghorn numbers. Pronghorn prefer vegetation whose height averages 15 inches (Yoakum, 1975). By the end of the growing season most of the grasses are grazed down to about 2 inches except for some small pastures on Goodwin Mesa. Large disturbed areas around stock tanks on the mesas may extend a fourth of a mile from a water and be devoid of escape or hiding cover. The lack of cover increases stress on the antelope and makes antelope more vulnerable to predators.

A major problem with food and cover in the planning area's pronghorn habitat is the decrease in perennials and increase in introduced annual species (Brown, 1980), causing a trend toward declining habitat condition and stability. If the trend is not reversed, the native grassland will become drastically reduced or eliminated altogether as has already occurred in the California interior grasslands in the previous century (Stoddart and Smith, 1955).

Fences block pronghorn movement, often causing death (Rouse, 1954; Yoakum, 1978). Presently, most fences in pronghorn habitat do not meet BLM's specifications for pronghorn.

Pronghorn population trends are downward in the planning area (BLM, 1980a,b).

Desert Bighorn Sheep

Approximately 19 desert bighorn sheep occupy 19,000 acres of crucial habitat in the southwestern EIS area near Aubrey Peak (Map 2-3). Bighorn sheep range through the Bateman Springs and Artillery Range allotments and through a part of Chicken Springs allotment. Historically, the bighorn extended into the Aquarius Mountains. Bighorn appear to have been eliminated from near Artillery Peak, Black Mesa, Eagle Point, the northern McCrackens, and the eastern Rawhide Mountains (next to the EIS area). The remaining bighorn habitat is considered crucial (BLM, 1980b). Food, water, and space are limiting factors to desert bighorn sheep in the planning area. Cover is not a problem.

Bighorn sheep feed on browse (57 percent), forbs (34 percent) and grasses (9 percent) (Seegmiller, 1977) in the paloverde vegetation type. Few excellent forage plants occur in this type, which rates next to last (after riparian) in percentage of key forage species. Bighorn primarily compete for forage with wild burros to the south and cattle to the north in the foothills with slopes less than 25 percent. Burros probably compete more effectively for forage than do cattle, since burros are opportunistic and destructive feeders. Recently wild burro numbers were reduced to the south of the EIS area, possibly allowing a slow recovery of habitat in the adjacent EIS area.

Lack of water is the single most limiting factor for desert bighorn sheep (Blaisdell and others, 1980). Good permanent water sources are lacking in bighorn habitat. Sixteen waters are known in the area, but stock tanks and wells developed for livestock prevail.

Bighorn sheep must be able to move freely and are typically intolerant of human disturbance and developments. Fences create hazards for bighorn. They block movement and are documented death-traps unless properly constructed (Russo, 1956; Kelly, 1960; and Helvie, 1971). Most fences in the EIS area do not meet BLM safety specifications for bighorn sheep.

Bighorn are also intolerant of livestock and wild burros. Cattle and wild burros compete with bighorn for space (Trefethen, 1975; McKnight, 1958), and an aversion to cattle keeps bighorn from preferred waters and foraging habitat. Wild burros have been known to foul waters used by bighorn and chase other wildlife

away from water. Gallizioli (1977) attributes the major bighorn declines on lands next to the EIS area to livestock overgrazing. In addition, livestock have brought diseases harmful to bighorn into sheep habitat (Bunch, Paul, and McCutchen, 1978).

The population trend for bighorn in the EIS area is unknown.

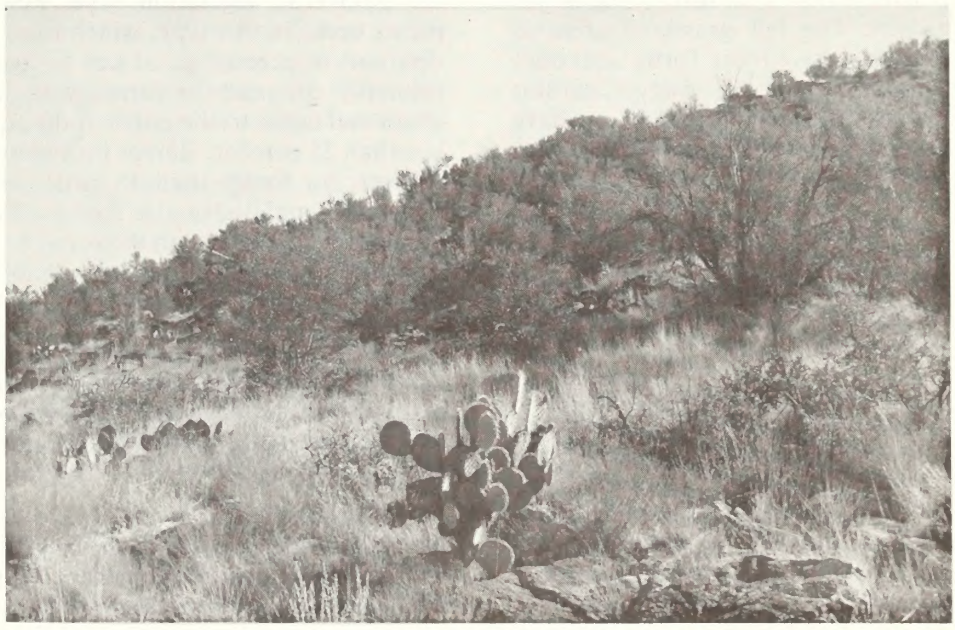
Javelina

Javelina are new arrivals to the planning area, having been introduced in 1967 by the Arizona Game and Fish Department (AG&FD). By 1979 javelina had spread from the northwest to the southeast in the EIS area. The relatively small population is increasing and expanding its range. Habitat conditions appear to be favorable. Javelina compete less with burros and livestock than do other big-game species because javelina eat different forage. Javelina are know to eat prickly pear cactus, acorns, berries, mesquite beans, succulents, and forbs. No limiting habitat factors are affecting the javelina population.

WATERFOWL AND SHOREBIRDS

Twenty-one species of waterfowl and 36 species of shorebirds routinely use aquatic habitats in the planning area. Nearly all are migrants whose numbers peak during spring and fall migrations. Alamo Lake, stock reservoirs, and riparian areas along Burro Creek, and the Big Sandy and Santa Maria Rivers, make up the major waterfowl and shorebird habitats. Many stock reservoirs dry up in late spring and summer or do not have enough bordering plant cover to provide nesting habitat. Some stock reservoirs on Goodwin and Bozarth Mesas would provide good waterfowl habitat if allowed to develop shoreline cover.

In a cooperative agreement between the Army Corps of Engineers and AG&FD, the Ocotillo Wildlife Area surrounding Alamo Lake was designated, partly to allow for waterfowl management. AG&FD habitat improvement plans, however, have not been implemented due to conflicts with wild burros and BLM grazing programs.



Chaparral Provides Valuable Big-Game Habitat

The chaparral vegetation type is one of the most productive for big game in the EIS area and provides habitat for several sensitive and State-listed animals as well. Chaparral in good condition consists of an open stand of large shrubs with grasses and forbs growing among the many palatable shrubs (pictured above). Chaparral in poor condition often forms a closed stand of less palatable shrubs with few grasses or forbs growing underneath.

Most of the aquatic habitats provide only resting areas for migrant species, since the condition of shoreline vegetation and vegetation around reservoirs is unsatisfactory (BLM, 1980a;b).

UPLAND AND SMALL GAME

Four species of upland game birds occur in the EIS area: Gambel's quail, band-tailed pigeons, mourning doves, and white-winged doves. Gambel's quail occur in all allotments. Their highest densities are in the paloverde, desert shrub, and grassland vegetation types. Few factors limit Gambel's quail populations in the EIS area. Though not greatly dependent on water, quail do benefit from its increased availability.

Food for quail is mainly a function of rainfall. If little rainfall results in few annuals, livestock use of the green plant material limits quail reproductive success (Gallizioli, 1960). Needed cover is lacking around most waters in the EIS area, exposing Gambel's quail to greater predation.

Band-tailed pigeons occur in moderate numbers in the ponderosa pine vegetation type. Their population is limited by the size of the ponderosa forest and the number of fruit-producing shrubs in the understory. Understory forage-producing plants are uncommon in the ponderosa pine type due to the type's poor to fair range condition.

Mourning and white-winged doves occur throughout the EIS area. White-wings concentrate along riparian drainages, where their numbers appear to be diminishing with the deterioration of the riparian habitat (Cottam and Trefethen, 1968).

Small-game species in the planning area are dominated by the desert cottontail and black-tailed jackrabbit. Desert cottontails live in areas with dense shrub layers. Protective cover in open habitats along washes and canyon bottoms is crucial. Livestock on many allotments, however, intensively use the washes and canyon bottoms reducing the shrub cover.

Black-tailed jackrabbits are most common in the open Joshua tree, paloverde, creosotebush, and grassland vegetation types. They are especially abundant in the Joshua tree areas of the La Cienega and Chicken Springs allotments where they are consuming large amounts of forage. The increase in jackrabbits appears to be associated with declining rangeland trend.

NONGAME

The EIS area is rich in nongame mammals, birds, reptiles, amphibians, and fish. Ten nongame fish, 63 reptiles and amphibians, 66 nongame mammals, and 220 nongame birds are known to use the habitats of the planning area. Approximately half of the nongame species use the area year round, whereas many of the bird species use it in winter or summer or only during migration. The vegetation types supplying habitat to the diversity of nongame wildlife are riparian, ponderosa pine, and paloverde (BLM, 1980a;b). Vegetation types having dramatically different assemblages of wildlife are grassland, ponderosa pine, and chaparral.

The major limiting factor to many of the nongame species in the EIS area is cover (Jones, 1979a;b; Peck, 1979; Hall, 1980). Each nongame species requires a different set of cover needs of living (vegetation) and nonliving (soil and rock) materials. The arrangement of these materials in each vegetation type determines habitat quality for nongame wildlife. Small mammals depend more on the substrate (soil and rocks) than do most other wildlife. Reptiles and amphibians depend about equally on substrate and vegetation for habitat. And birds depend more on vegetation characteristics (MacArthur and MacArthur, 1961; Anderson and others, 1977).

The most important characteristics of vegetation cover are the structural (height and volume) diversity of plants and their distribution (patchiness) on the landscape (Ohmart, 1979). For example, reptiles such as the desert spiny lizard prefer downed ground cover in many habitats (Jones, 1979a), whereas western whiptails prefer more open ground. Cassin's sparrows and western meadowlarks prefer areas without tall plants and with abundant cover 10-20 inches high. Sufficient cover less than 15 inches high is a habitat requirement for at least half the area's nongame species (BLM, 1980a;b), but 555,000 acres or 65 percent of public lands in the EIS area lack this important structural component. Riparian vegetation characteristically lacks all but the tallest components of vegetation structure, placing it in the poorest of habitat condition for wildlife when compared to its potential.

Water is an important limiting factor for some nongame species. Amphibians and fish are particularly dependent on water and are generally restricted to the major riparian areas, springs, stock tanks, and canyons, including Burro Creek and the Big Sandy and Santa Maria Rivers. Most of the waters in the EIS area are in poor condition for aquatic wildlife.

PROTECTED AND SENSITIVE WILDLIFE

Federally Listed

The EIS area has two federally listed endangered species—the bald eagle and the peregrine falcon—and two species under status review—the desert tortoise and Bell's vireo.

The endangered bald eagle winters in moderate numbers along Burro Creek and the Big Sandy and Santa Maria Rivers. It preys primarily on fish, which are affected by water removals and contamination of the aquatic habitat. Rumors of bald eagles nesting in the area have not been substantiated (Millsap, 1979). Roost trees and perching sites are usually old decadent cottonwoods. Unfortunately, many of these cottonwoods are not being replaced in the riparian habitat due to excessive livestock utilization (Millsap, 1979).

The endangered peregrine falcon is a rare migrant through the EIS area. A study by David Ellis (Contract No. 16-928-CA, USDA Forest Service, Rocky Mountain Forest and Range Experimental Station) of breeding peregrine falcon sites in Arizona found no peregrines breeding in the EIS area, although it found potential sites along the major drainages.

The U.S. Fish and Wildlife Service is reviewing the status of the desert tortoise and Bell's vireo (43 FR 37662, August 23, 1978 and 45 FR 8030, February 6, 1980), both of which occur in the EIS area.

The desert tortoise, listed by AG&FD as threatened, occurs primarily in four areas designated as crucial habitat. The major limiting factor for desert tortoises is forage. When tortoises awake from hibernation, they rely on a substantial harvest of winter-spring annuals to provide energy for the year's reproductive effort. Drought and livestock use, however, lessen the supply of annuals and threaten tortoise reproduction (Berry, 1978).

Bells' vireo is being considered by the Fish and Wildlife Service for listing as a threatened or endangered species in the Southwest. It occurs in the EIS area's riparian habitats, where it is an uncommon breeder. The limiting habitat factor for Bell's vireo appears to be the condition of the riparian vegetation, since this species occurs only in areas of good or excellent condition. Ninety-eight percent of the riparian habitat is in poor or fair condition due primarily to livestock and wild burro concentrations and overuse (BLM, 1980a;b).

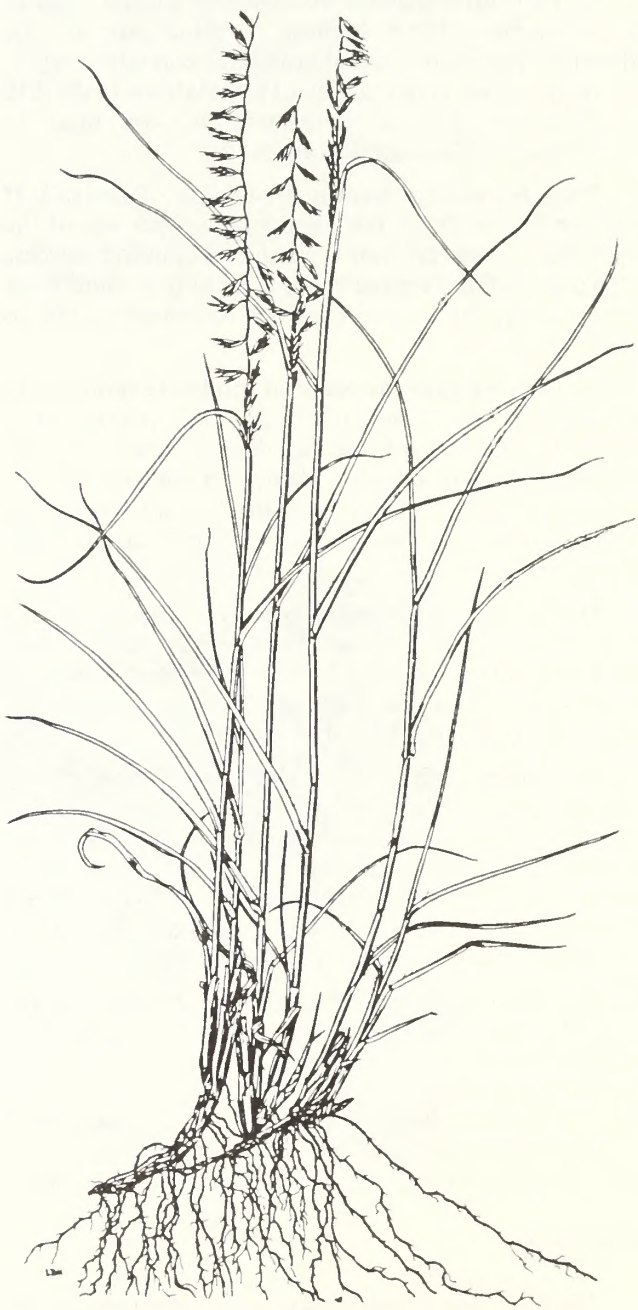
State Listed

Besides the desert tortoise, peregrine falcon, and bald eagle, nine other species listed by the AG&FD as threatened in Arizona are present or may occur in the EIS area: spotted bat, black hawk, zone-tailed hawk, great egret, snowy egret, black-crowned night heron, Gilbert's skink, Gila monster, and Sonoran mountain kingsnake.

The spotted bat may occur near Burro Creek, the Santa Maria River, or the Hualapai Mountains, although there are no known records of its occurrence in the area.

The black hawk is a peripheral species in Arizona, restricted to riparian habitats along perennial streams. In the EIS area, black hawks nest on Burro, Francis, Conger, Pine, and Trout Creeks.

Several habitat factors limit black hawks in the area. Old stands of cottonwoods and other black hawk



Sideoats Grama

nesting trees are decaying and not being replaced due to livestock and burro destruction of cottonwood, willow, and ash seedlings. In addition, black hawks prey mostly on fish and amphibians, which are at the mercy of water volumes in streams. Mining operations use water from some of these perennial drainages and release contaminated water into the same systems (Kepner, 1979; Millsap, 1979).

Zone-tailed hawks are uncommon nesters in the EIS area, nesting in riparian areas along streams and at springs and feeding in upland habitats. Their major limiting habitat factor is the lack of new trees to replace older stands used for nesting.

Great egrets, snowy egrets, and black-crowned night herons use Alamo Lake, stock tanks, and riparian habitats for migrant resting, although they may have nested there in the past (Hall, 1979). Limiting factors discussed for black hawks (food and cover) are generally similar for these species.

Gilbert's skink is a small rare lizard primarily inhabiting riparian, chaparral, and grassland vegetation types in the EIS area. Jones (1979a; 1980) found that Gilbert's skink requires a substantial amount of cover less than 1 foot high in addition to the normal overstory vegetation. Fifty-six percent of the 155,000 acres of preferred skink habitat lacks low-level cover (mostly perennial grasses and forbs). The remainder of skink habitat is in fair condition.

The Gila monster occurs throughout the EIS area but is more prevalent in desert shrub and chaparral and slightly rarer in paloverde habitats (Jones, 1979a). Limiting factors for Gila monsters are similar to those for the Gilbert's skink due to the Gila monster's prey needs.

The Sonoran mountain kingsnake occurs in the ponderosa pine and pinyon-juniper vegetation types of the Hualapai Mountains near springs and intermittent drainages. The kingsnake requires downed litter, low shrubs, and grass cover (also used by its prey) under a taller relatively dense canopy of trees (BLM, 1980b). Trampled spring sites, trails along drainages, and the lack of low shrubs and grasses are limiting the Sonoran mountain kingsnake.

BLM Sensitive Species

BLM maintains a list of sensitive wildlife species for the Phoenix District. These are species likely to be federally or State listed if habitat trends are not reversed. Included on the list are the following planning area residents: the Hualapai (Mexican) vole, kit fox, ferruginous hawk, spotted owl, desert night lizard, and desert rosy boa. Grazing in the EIS area is not likely to significantly affect the desert rosy boa, spotted owl, desert night lizard, or kit fox (BLM, 1980b).

The Hualapai (Mexican) vole (*Microtus mexicanus hualapaiensis*) occurs only in the ponderosa pine vegetation type in the Hualapai Mountains on 4,350 acres of public land. Two major habitat factors limit the Hualapai vole—cover and food.

The vole needs a cover of perennial forbs and grasses to protect it from easy detection by its many predators. An adequate ground cover of forbs and grasses (30-60 percent cover, 10-14 inches height), however, is virtually nonexistent. Voles also feed on perennial forbs, grasses, and twigs of low-level shrubs (Burt and Grossenheider, 1976). Since perennial forbs and grasses are greatly reduced, the Hualapai vole is rare and may suffer extirpation (BLM, 1980b).

The ferruginous hawk winters and may breed in the Aquarius Planning Unit. These birds of prey are relatively tolerant of habitat disturbances, but they require a savanna-like grassland aspect, abundant rodent prey more likely found with fair condition grassland, and relatively undisturbed sites for nesting and roosting (Call, 1978; Sherrod, 1978).

RIPARIAN HABITAT

Riparian habitats are the most productive in the EIS area. A riparian plant community or plant association is one that occurs in or next to a drainageway, flood plain, or spring and whose species or life forms differ from those of the immediately surrounding vegetation (Lowe, 1964). Riparian habitats are associated with perennial and intermittent streams, washes, and reservoirs. Map 2-1 shows major riparian habitats on public lands.

Jahn and Threfethen (1972) stated "regardless of species, riparian vegetation is the most valuable wildlife habitat in Arizona." These areas are oases in the desert for wildlife. Spring and riparian habitats not only provide a water source for many land animals but are extremely important as production areas of invertebrates, which are prey for fish, frogs, and lizards, which are prey for snakes and birds, which in turn are prey for carnivorous mammals and birds of prey (Thomas, Maser, and Rodiek, 1979). Without woody plant cover provided by cottonwood, willow, and ash trees in these riparian areas, many wildlife species would not inhabit the EIS area.

Virtually all riparian habitats in the planning area are deteriorated, producing far below their potential. Livestock and wild burros are trampling soil and succulent forbs and are browsing and trampling cottonwood, willow, and ash seedlings. Eliminating tree seedlings prevents the replacement of mature trees, which are the basis for the richness of the riparian resource. Old and decadent riparian trees are not being replaced by young ones, resulting in the imminent decline and possible elimination of many protected and sensitive animals.

TABLE 3-7
EXISTING WILDLIFE AND HABITAT IMPACT TREND RATINGS[1]

Alternative's Features	Big Game					Special Status Species				
	Mule Deer	Elk	Bighorn Sheep	Pronghorn Antelope	Javelina	Federal-Listed Threatened/ Endangered Species	Other Protected Species[2]	Upland and Small Game	Nongame Wildlife	Riparian Habitats
Grazing Use										
Vegetation Production Available	2	2	3	2	3	2	2	3	2	1
Levels of Grazing Management										
Yearlong	2	2	2	2	3	3	2	3	3	1
Nonintensive	2	2	2	2	3	3	2	3	3	1
Ephemeral	3	NA	3	NA	3	3	3	3	3	2
Management Facilities										
Water Developments	2	3	2	3	3	3	2	2	2	1
Fencing	2	3	2	2	3	3	3	3	3	3
Totals (Average)	2.2	2.5	2.4	2.3	3.0	2.8	2.4	2.8	2.6	1.6
						Average Rating for Existing Situation 2.5				

[1] The rating system is as follows: 1 = most significant downward trend; 2 = downward trend; 3 = relatively static; 4 = upward trend; 5 = most significant upward trend; NA = not applicable.

[2] Proposed threatened or endangered species, State-listed species, BLM sensitive species.

Conflicts and present impacts to wildlife and riparian habitat along the Burro Creek drainage and the Big Sandy and Santa Maria Rivers are severe enough that BLM has proposed these areas as areas of critical environmental concern (ACECs).

Table 3-7 presents an overview of ongoing impacts and apparent trends toward wildlife.

WILD BURROS

The EIS area has four burro use areas where burros roam on all or part of 13 grazing allotments (Map 3-1), and as many as 843 burros (see Productivity) may be foraging over 173,058 acres of public land.

A fifth burro use area in the southernmost part of the Hualapai Planning Unit is included in the Alamo Herd Management Area administered by the BLM Lower Gila Resource Area Office. Since Alamo Crossing Allotment (administered by the BLM Kingman Resource Area Office) is also included in the Alamo Herd Management Area, its burro management will not be considered in this EIS. The estimated 15 burros on that allotment, however, have been included in the overall burro population figures for the allocation of forage.

The range condition of the public lands within the four burro use areas is as follows: 4 percent in excellent condition, 21 percent in good condition, 64 percent in fair condition, and 11 percent in poor condition (BLM, 1980a). These lands can produce 7,308 AUMs (BLM, 1980a). The 843 wild burros will require 5,058 AUMs (1 burro unit month = 0.5 AUMs) or 69 percent of all forage available for grazing under a 50 percent utilization criterion. Not all burro use areas, however, are in the same general condition. All public lands in excellent condition within the burro use areas are located in herd area 1A, Sycamore Creek, (BLM, 1980a). In herd area 1B, Burro Creek, 92 percent of the public lands are in fair condition or less and produce only 1,125 AUMs. As of January 1981, herd area 1B may be supporting a burro population of 232 animals. Such a herd requires 1,392 AUMs, exceeding the proper stocking level by 267 AUMs or 44 burros.

PRODUCTIVITY

An inventory in June 1979, using the Lincoln index inventory method (BLM, 1980a), found an estimated 652 burros residing in the EIS area (excluding 15 burros on the Alamo Crossing allotment). Exhibiting no breeding or foaling season (BLM, 1980a), EIS area burro populations are estimated to increase at a rate of 20-25 percent every 18 months or 13-17 percent annually (Ohmart, 1975).

CONFLICTS

Burros require 69 percent of the available forage on public lands (see burro use areas). Also, since a burro requires 1,460 gallons of water a year to survive (BLM, 1980a), the 843 burros in the burro use areas require 1,230,780 gallons (3.8 acre-feet) of water per year. During the hot dry periods, when water is the most limiting factor on desert rangelands, burros concentrate within 1.5 miles of perennial waters.

LIVESTOCK GRAZING

EXISTING OPERATIONS

Thirty-one permittees operate 45 grazing allotments in the EIS area, involving 856,749 acres of public land. All or portions of 10 allotments lie in Yavapai County, and all or portions of 37 allotments lie in Mohave County.

The livestock operations and allotments in the EIS area vary greatly and may involve complex relationships. An operation may involve one or more allotments. An allotment itself may be enclosed within a single boundary or may consist of two or more separated areas or pastures. A livestock operation may be run by an individual, a family, a corporation, or a combination of these three. Individual livestock operations contain from 303 to 102,354 acres of public land.

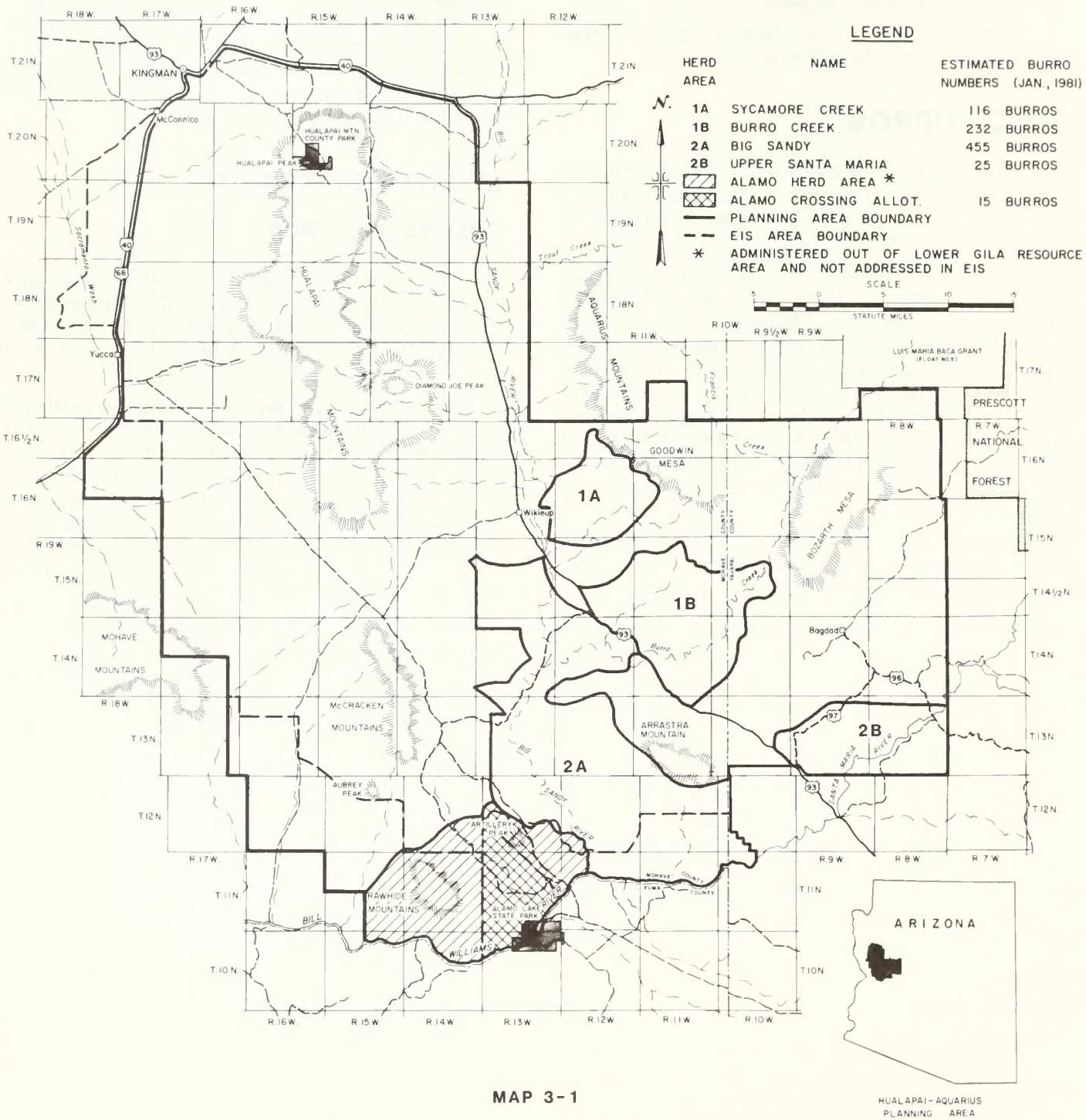
Over half of the livestock operators using public lands have sources of income other than their ranch operations in the EIS area. These sources vary from farms, feedlots, and ranches outside the EIS area, to jobs unrelated to agriculture.

From 5-year average licensed use records, EIS area ranches have been divided into three size categories: small ranches—0-150 head; medium-sized ranches—151-300 head, and large ranches—over 300 head[1].

The 11 small ranches have a combined authorized grazing preference of 552 head, but their licensed use over the past 5 years has averaged only 410 head or 74 percent of preference. The 10 medium-size ranches have a combined authorized grazing preference of 2,124 head but a 5-year average licensed use of 1,858 head or 87 percent. And the 10 large ranches have a combined authorized grazing preference of 6,636 head but a 5-year average licensed use of 4,788 or 72 percent. The combined authorized grazing preference for all ranches in the EIS area is 9,312 head, and the 5-year average

[1] In describing and analyzing ranch operations, livestock numbers for Federal, State, and private land have been used to present a complete overview of how BLM proposals would affect ranching. To be consistent with the remainder of the allocation process, data used elsewhere in the EIS to describe livestock numbers are for public lands only.

BURRO HERD AREAS



MAP 3-1

TABLE 3-8
RANCH OPERATIONS BY SIZE CLASS
(Allotments and Public Acres)

Small Ranches (0-150 Head)			Medium Ranches (151-300 Head)			Large Ranches (301 Head and Over)		
Public Acres	Allotments	Percent Public Land	Public Acres	Allotments	Percent Public Land	Public Acres	Allotments	Percent Public Land
1,702	Round Valley Hot Springs	88	34,588	Burro Creek Ranch	89	71,853	Artillery Range	81
640	Kayser Wash	*	17,565	Gibson	53	5,302	Hualapai Peak 'A'	41
							'B'	*
3,150	Fancher Mountain	*	24,767	Arrastra Mountain	96			
						102,354	Bateman Springs	63
13,831	Gray Wash	56	38,705	Boriana	74		Chicken Springs	
	Groom Peak						Bottleneck Wash	*
			32,944	Greenwood Pk. Comm.	68			
8,363	Wikieup	76				73,406	Walnut Creek	87
			56,528	Alamo Crossing	86			
4,819	Burro Creek	80		Chino Springs		21,912	Yellow Pine 'A'	56
				Greenwood Comm.			'B'	*
1,385	White Springs	*						
			15,478	Kent's Cane Spring 'A'	46	50,957	Francis Creek	46
25,534	Happy Jack Wash	62		'B'	*			
						9,180	McElhaney	100*
14,310	Lazy YU 'A'	57	26,663	Bagdad	64			
	'B'	*		Kellis	*	86,940	Big Sandy	70
							Cane Springs	
3,650	Sweetmilk	*	16,249	Diamond Joe	71		Los Molinos	
							Sandy	
			21,190	Lines	69		Little Cane	
1,078	DOR	42		Black Mesa			Trout Creek	*
							Byner	*
						71,303	La Cienega	43
						303	JJJ	*

* These figures are not applicable to allotments or portions of allotments being proposed for nonintensive management. Total acreage figures were not available.

licensed use is 7,056 head or 76 percent of preference. Table 3-8 breaks down size classes by allotment, public acres, and percent public land.

On perennial-ephemeral allotments operators may apply for a supplemental license to use annual (ephemeral) vegetation when it is abundant. An ephemeral license allows operators to increase livestock numbers above their base herd as long as annual vegetation remains. Annual vegetation production depends on spring and fall moisture being adequate to produce extra feed. An ephemeral license, however, is seasonal and cannot be counted on from year to year.

Three operators run seasonal yearling operations on five allotments, involving 15 percent of the EIS area's public lands. The DOR allotment is designated ephemeral. Alamo Crossing, Chino Springs, Greenwood Community and La Cienega allotments are designated perennial-ephemeral but are managed as seasonal yearling operations. No grazing allotments within the EIS area are managed under allotment management plans (AMPs).

All allotments have rangeland developments constructed to manage livestock distribution (water developments, fences, and cattleguards) or to facilitate livestock management (corrals). Developments for controlling livestock distribution have been constructed by BLM, by operators, or by both through cooperative agreements. In the EIS area these developments include 76 reservoirs, 158 improved springs, 129 wells, 116 miles of pipeline, 14 cattleguards, and 639 miles of fence.

LIVESTOCK PERFORMANCE

Most ranches in the EIS area run cow-calf operations under yearlong grazing, deriving most of their income from the sale of calves, yearlings, and cull cows. Calf crops are relatively low and range from 55-62 percent, depending on ranch size. An average of from 17 to 20 percent of cows are culled from herds each year. Table 3-9 shows herd parameters for each ranch size.

TABLE 3-9
HERD PARAMETERS FOR RANCH SIZES

Herd Parameters	Ranch Size		
	Small Ranch 0-150 Head	Medium Ranch 151-300 Head	Large Ranch More than 300 Head
Brood Cows (Number)	67	212	788
Bulls (Number)	7	21	79
Herd Size (Number)	73	233	867
Cull Cows (Percent)	20	17	17
Cow Death Loss (Percent)	8	4	4
Calf Death Loss (Percent)	8	5	5
Calf Crop (Percent)	55	62	62

Source: BLM, 1980c

VISUAL RESOURCES

The EIS area is located in the Basin and Range physiographic province, and has scenery varying from mountain coniferous forests to Sonoran desert scrub. The area's topography varies from rugged mountains to broad plains. Much of the area is virtually undisturbed, although major intrusions consist of access roads, evidence of mining and ranching, and public utility rights-of-way.

BLM land planning efforts have established visual resource management (VRM) classes for all public lands in the EIS area, using the BLM 8400 VRM Planning Manual. These classes provide a basis for determining a proposed land management activity's visual impact and mitigating measures required to bring the activity within the acceptable limits of the VRM class.

VRM classes, their objectives, and required management practices are as follows.

Class I - Class I provides primarily for natural ecological changes only. It is applied to primitive areas, some natural areas, and similar situations where management activities are to be restricted.

Class II - Changes in any of the basic elements (form, line, color, or texture) caused by a management activity should not be evident in the characteristic landscape.

Class III - Changes in the basic elements caused by a management activity may be evident in the characteristic landscape, but the changes should remain subordinate to the visual strength of the existing character.

Class IV - Changes may subordinate the original composition and character but must reflect what could be a natural occurrence within the characteristic landscape.

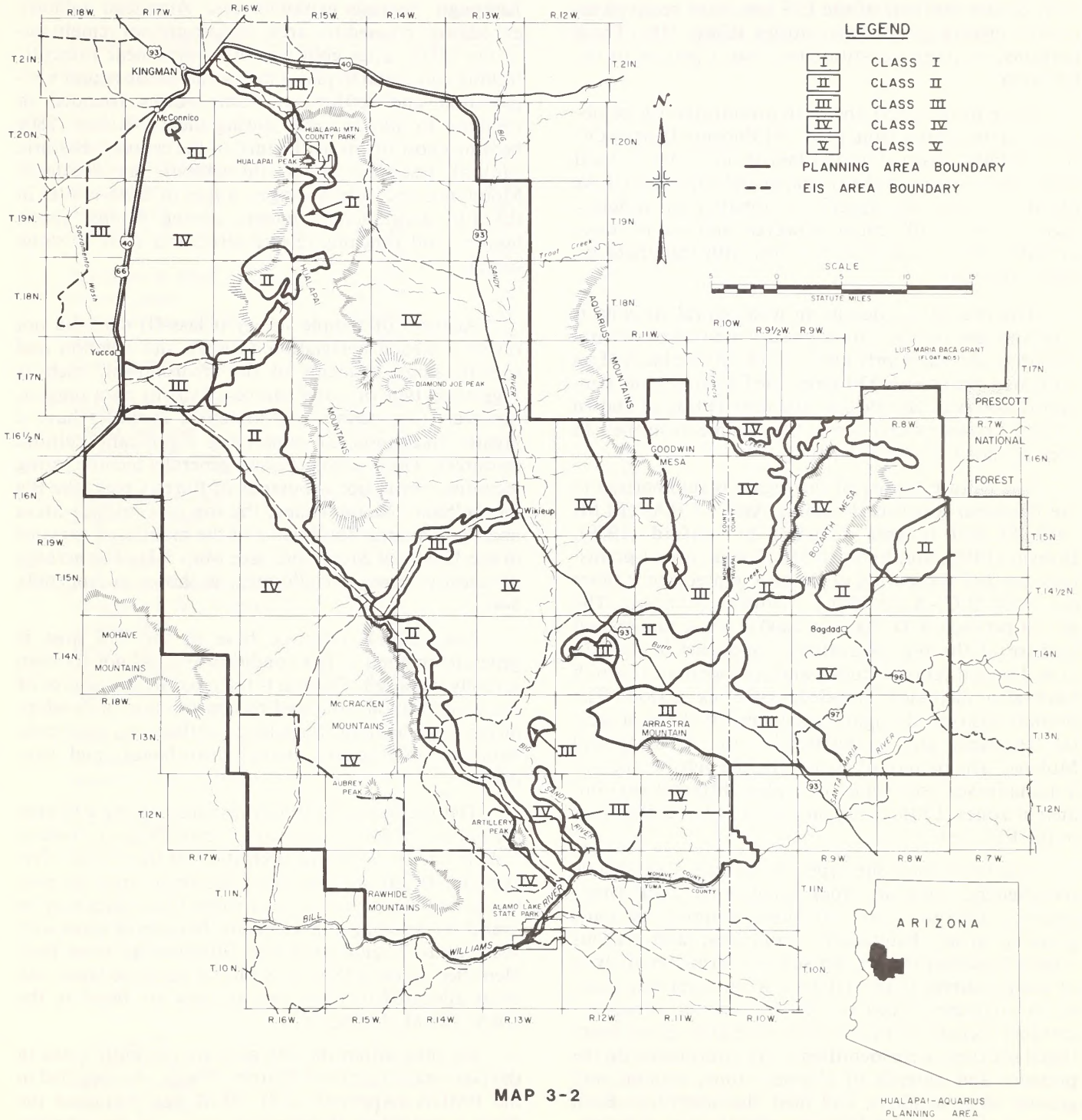
Class V - Change is needed. This class applies to areas where the naturalistic character has been disturbed to a point where rehabilitation is needed to bring it back into character with the surrounding countryside. This class would apply to areas identified in the scenery evaluation in which the quality class has been reduced because of unacceptable intrusions. It should be considered an interim short-term classification until one of the other objectives can be reached through rehabilitation or enhancement. The desired visual quality objective should be identified.

VRM classes for the EIS area are shown on Map 3-2.

CULTURAL RESOURCES

The analyses and conclusions concerning cultural resources in this EIS are based upon data from several levels of inventory. BLM has recently conducted an existing data inventory (Class I) of west-central Arizona, which identified 158 sites in the EIS area. In May 1979, BLM completed a field sample inventory (Class II) of the EIS area, using a 1.3 percent sample to gather data for planning documents and this EIS. These inventories

VISUAL RESOURCE CLASSES



MAP 3-2

were conducted in accordance with the Programmatic Memorandum of Agreement (PMOA) between the BLM and the Advisory Council on Historic Preservation, dated January 14, 1980 (Appendix 2-8). In addition, certain portions of the EIS area have received intensive project-specific inventories (Class III). These portions, however, constitute less than 1 percent of the EIS area.

More information about all inventories can be obtained upon request from the BLM Phoenix District Office. Detailed discussion of Class II inventory method and analysis occurs in the Hualapai and Aquarius URAs (BLM, 1980a;b). Site-specific information on archaeological sites is confidential, however, and will be made available only to qualified persons with legitimate research interests.

The overall site density in west-central Arizona is relatively low and the nature and distribution of cultural resources are still poorly understood. On the basis of an estimated one site per 130 acres, the EIS area could contain 10,000 sites. Site density and distribution of known cultural resources vary across the allotments in the EIS area as shown in Table 3-10.

The culture history of the region is summarized in the Hualapai-Aquarius Planning Area's URAs (BLM, 1980a;b) and is also discussed in Linford (1979), Dobyns (1956), and Euler (1958). The nature of prehistoric use and occupation of the area in preceramic times (ca. 9000 B.C.–A.D. 700) is virtually unknown. The period between A.D. 700 and 1600 is better understood because of the few excavations conducted in the EIS area. Limited ceramic studies and ethnographic research have also increased knowledge of this period. The primary historic aboriginal occupants of the area were the Hualapai and probably also the Yavapai and Mohave. The pattern of settlement and subsistence was a nomadic seasonal round to exploit different environmental zones. Little information exists for dating sites in the EIS area.

The prehistoric site types in the EIS area include rockshelters, rock art, rock alignments, rock rings, quarries, hilltop "fort" structures, chipping stations, grinding areas, habitations, campsites, and various types of unclassified artifact scatters. From an analysis of sample survey (Class II) data, an attempt was made to differentiate artifact scatters by function, since this category includes most sites in the EIS area. Seven functional site types were identified using information on the presence and absence of chipped stone, ceramic and ground stone artifacts, and their characteristics. Each site type represented a different combination of, or emphasis on, various activities, such as tool production, lithic resource procurement, vegetal resource processing, and hunting. Habitation sites were distinguished by overall size and complexity, having more and greater varieties of artifacts.

The historic settlement and development of west-central Arizona is poorly documented in accounts of Arizona history. Some discussion of local historic events can be found in Paher (1970) and Malach (1975). Although Spanish explorers and American military expeditions crossed the area, settlers did not remain until the 1860s, after gold was discovered near Prescott. Mining continued to play a major role in the region's exploration and settlement. Many towns founded in response to mining needs during the 1870s and 1880s became ghost towns by the turn of the century. Historic cultural resources occur throughout the Hualapai Mountains and nearby ranges. Types of historic sites in the EIS area include mines, mining camps, ranch houses, and ranching-related structures such as stone corrals.

Analysis of sample survey (Class II) data did not reveal a strong correlation between site location and specific single elements of the environment, such as vegetation type or water sources. Existing data suggest, however, that certain physiographic localities have a greater likelihood of containing significant cultural resources. These sensitive areas generally include spring vicinities, the major tributaries of Burro Creek, the Big Sandy/Santa Maria Valley, the top of Goodwin Mesa and the Aquarius foothills, and the mouths of canyons in the Hualapai Mountains (see Map 3-3). The acreage of sensitive areas per allotment is shown in Appendix 3-4.

The cultural resource base in the EIS area is generally in good to fair condition and has not yet been severely impaired. Erosion is the most serious source of site deterioration, followed by construction of developments (e.g., mining, rangeland, settlement), road construction and access, animal disturbance, and vandalism.

The majority of cultural resources in the EIS area are important for their potential scientific uses, since so little is known about the prehistory of the region. Certain significant sites or areas, however, may be protected and conserved for future use. Other sites may be useful for studying impact trends. No sites or areas with sociocultural significance (see Glossary) have yet been identified in the EIS area. Cultural resource types and areas allocated to these various uses are listed in the URAs (BLM, 1980a;b).

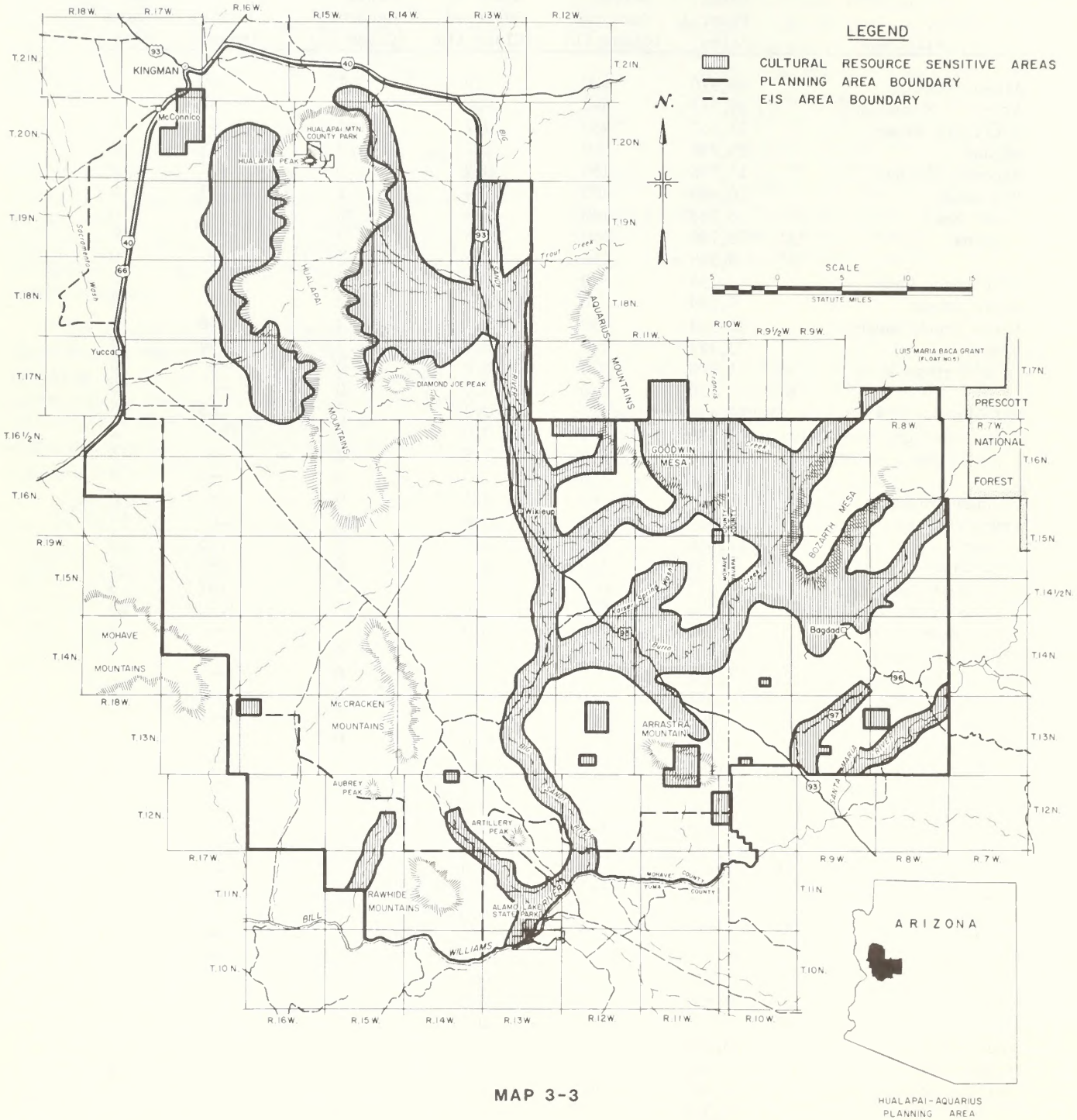
No sites within the EIS area are currently listed in the National Register of Historic Places. As specified in the PMOA (Appendix 2-8), BLM has evaluated the Class I and Class II inventory results in consultation with the State Historic Preservation Officer. A list of multiple resource areas and individual properties, identified as potentially eligible for inclusion in the National Register of Historic Places will be included in the final EIS.

TABLE 3-10
DENSITY AND DISTRIBUTION OF CULTURAL RESOURCE SITES

Allotment		Total Federal Acres	Federal Acres Surveyed (Class II)	% Federal Land Surveyed (Class II)	No. of Sites Recorded (Class II)	Density Index*	Total No. Known Sites
Alamo Crossing		20,910	400	1.9	1	.25	1
Arrastra Mountain		24,767	640	2.6	3	.47	3
Artillery Range		71,853	480	0.7	5	1.0	8
Bagdad		25,296	560	2.2	5	.89	10
Bateman Springs		17,786	160	0.9	0	—	0
Big Sandy		56,643	800	1.4	1	.13	5
Black Mesa		6,968	160	2.3	0	—	0
Boriana	'A'	28,786	160	0.6	0	—	0
	'B'	9,919	160	1.6	0	—	0
Bottleneck Wash		134	0	0.0	0	—	0
Burro Creek		4,819	80	1.7	2	2.5	2
Burro Creek Ranch		34,588	800	2.3	3	.38	6
Byner		3,727	320	8.6	3	.94	13
Cane Springs Wash	'A'	1,400	0	0.0	0	—	0
	'B'	120	0	0.0	0	—	0
Chicken Springs		84,434	800	0.9	5	.63	5
Chino Springs		19,146	0	0.0	0	—	2
Diamond Joe		16,249	240	1.5	0	—	1
DOR		1,078	0	0.0	0	—	0
Fancher Mountain		3,150	80	2.5	0	—	0
Francis Creek		50,957	1,920	3.8	20	1.0	24
Gibson		17,565	640	3.6	5	.78	10
Gray Wash		8,555	560	6.5	0	—	0
Greenwood Community		16,472	640	3.9	3	.47	3
Greenwood Pk. Community		32,944	1,200	3.6	17	1.4	26
Groom Peak		5,276	0	0.0	0	—	0
Happy Jack Wash		25,534	160	0.6	0	—	0
Hot Springs		1,062	0	0.0	0	—	1
Hualapai Peak		5,302	0	0.0	0	—	0
JJJ		303	0	0.0	0	—	0
Kayser Wash		640	0	0.0	0	—	1
Kellis		1,467	0	0.0	0	—	0
Kent's Cane Spring	'A'	14,143	80	0.6	0	—	0
	'B'	1,335	0	0	0	—	6
La Cienega		71,303	640	0.9	0	—	2
Lazy YU	'A'	12,370	80	0.6	2	2.5	13
	'B'	1,940	0	0.0	0	—	0
Lines		14,222	160	1.1	1	.6	1
Little Cane		5,718	0	0.0	0	—	0
Los Molinos		17,551	240	1.4	0	—	0
McElhaney		9,180	320	3.5	0	—	2
Round Valley		640	0	0.0	0	—	0
Sandy	'A'	600	80	13.3	0	—	0
	'B'	541	0	0.0	0	—	0
Sweetmilk		3,650	0	0.0	0	—	1
Trout Creek		640	0	0.0	0	—	2
Walnut Creek		73,406	960	1.3	5	.5	8
White Spring		1,385	0	0.0	0	—	0
Wikieup		8,363	240	2.9	0	—	2
Yellow Pine	'A'	21,358	160	.7	0	—	0

*Density Index = no. of sites ÷ no. acres surveyed x 100, based on BLM Class II inventory only.

CULTURAL RESOURCE SENSITIVE AREAS



MAP 3-3

RECREATION

The Hualapai-Aquarius EIS Area is relatively remote and sparsely populated. Concentrated visitor use is predominant in those areas developed specifically for recreation use. Developed areas include the Hualapai Mountains County Regional Park, the BLM Wildcow Campground, and the Boy Scout and Girl Scout camps in the Hualapai Mountains. Other developments are the BLM Burro Creek Campground on Burro Creek and Alamo Lake State Park on the Bill Williams River (Map 3-4).

A more dispersed type of recreation use occurs throughout the rest of the planning area. The major activity is hunting, which accounts for an estimated 65 percent of the visitor use. Other recreation includes camping, sightseeing, ORV use, rock collecting, and picnicking. Table 3-11 summarizes visitor use in the planning area.

TABLE 3-11
ESTIMATED VISITOR USE

Recreation Activity	Primary Season of Use	Total Visitor Days/Year	Percent of Total
Hunting - Big Game	Fall, Winter	30,600	28.0
Hunting - Small Game	Year Round	2,200	2.0
Hunting - Upland Game	Fall, Winter	38,050	35.0
Rock Collecting	Year Round	2,700	2.0
ORV Use	Year Round	4,000	4.0
Camping	Fall, Spring	20,800	19.0
Picnicking	Fall, Spring	150	0.1
Sightseeing within Planning Area	Year Round	11,510	10.0
Other*	N.A.	Negligible	N.A.
TOTAL		110,010	100.1**

Visitor use for the following developments is not shown above.

	Visitor Days/Year
Alamo State Park & Reservoir	125,000
Hualapai Mtn. County Regional Park	100,000
Boy Scout and Girl Scout Camps	Onknown

* Includes hiking, trapping, backpacking, swimming, and bird watching.
** Total does not equal 100 due to rounding.

Source: (BLM, 1980a;b)

WILDERNESS VALUES

The Federal Land Policy and Management Act of 1976 (FLPMA) mandates an inventory of all roadless areas of 5,000 acres or more that have wilderness characteristics as described in the Wilderness Act of 1964.

The wilderness inventory process for the Hualapai-Aquarius Planning Area was accelerated to comply with a court-ordered land-use planning and EIS schedule. Of the planning area's 18 intensive inventory units identified through the BLM wilderness inventory process (BLM, 1978a), the following 8 units are proposed as wilderness study areas (WSAs).

Unit No.	Unit Name	Public Acres
2-37/43	Wabayuma Peak	36,730
2-53	Planet	12,765
2-54	Aubrey Peak	15,240
2-56	Black Mesa	17,010
2-58*	Rawhide Mountains	62,300
2-59*	Arrastra Mountain	111,200
2-60	Lower Burro Creek	22,300
2-62	Upper Burro Creek	27,390

* A total of 36,200 acres of the proposed Rawhide Mountains WSA (unit 2-58) and 200 acres of the proposed Arrastra Mountain WSA (unit 2-59) extend outside the Hualapai-Aquarius EIS area boundary.

The proposed wilderness study areas in the EIS area are shown on Map 3-4.

ECONOMIC AND SOCIAL CONDITIONS

ECONOMIC CONDITIONS

Ranch Economics

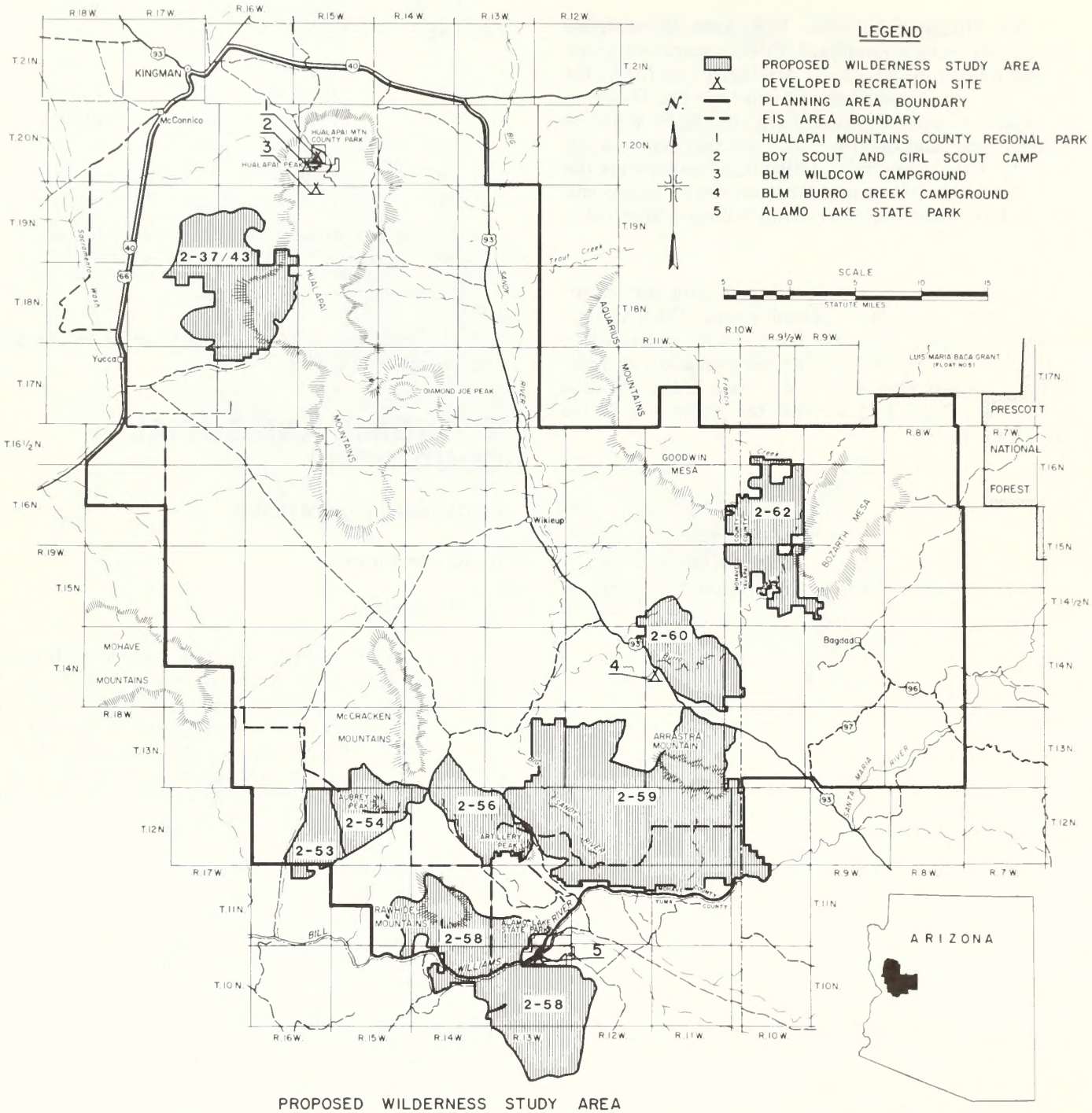
Ranch Budgets

The lack of specific information about each ranch in the EIS area made it necessary to develop typical ranch budgets to analyze the financial condition of ranches. To facilitate the development of ranch budgets, the 30 ranch operations[2] in the EIS area affected by the various alternatives were divided into three groups by herd size: 0–150 cows (67 cows typical), 151–300 cows (212 cows typical), and more than 300 cows (788 cows typical). BLM range specialists and economists with the help of EIS area ranchers developed ranch budget data representative of each size class and used these data to develop representative ranch budgets for each size class. The income statements derived from these representative budgets are shown in Table 3-12. Although the terms "representative" and "typical" are used, the EIS area has no typical ranches. Each ranch has unique characteristics. Detailed information on the ranch budgeting process is included in the Hualapai-Aquarius Planning Area Analysis (PAA) (BLM, 1980c).

Small Ranch. The typical small ranch has a base herd of 67 cows and earns a net revenue (gross revenue minus cash costs) of $2,215. Subtracting a charge for owner-operator labor and depreciation from the yearly net revenue reveals that the small operator suffers a net loss of $1,580 per year (Table 3-12).

[2] The EIS area actually contains 31 ranch operations. Since the DOR Ranch, a small ranch, is strictly ephemeral and not typical of ranches in the area, it was not used in this analysis.

PROPOSED WILDERNESS STUDY AREAS AND DEVELOPED RECREATION SITES



PROPOSED WILDERNESS STUDY AREA

UNIT No.	UNIT NAME	UNIT No.	UNIT NAME
2-37/43	WABAYUMA PEAK	2-58	RAWHIDE MOUNTAINS
2-53	PLANET	2-59	ARRASTRA MOUNTAIN
2-54	AUBREY PEAK	2-60	LOWER BURRO CREEK
2-56	BLACK MESA	2-62	UPPER BURRO CREEK

MAP 3-4

Medium-Size Ranch. The typical medium-size ranch has a base herd of 212 cows and earns a yearly net revenue of $10,567 per year. Subtracting a charge for owner-operator labor and depreciation reveals that the typical medium-size ranch suffers a net loss of $13,436 per year (Table 3-12).

Large Ranch. The typical large ranch has a base herd of 788 cows and earns a yearly net revenue of $18,435 per year. Subtracting a charge for owner-operator labor and depreciation reveals that this size ranch suffers a yearly net loss of $17,022.

TABLE 3-12
REPRESENTATIVE RANCH INCOME STATEMENTS

Item	Ranch Size Small 67 Head	Medium 212 Head	Large 788 Head
Revenue[1]	$ 6,532	$25,338	$96,084
Cash Costs[2]	4,317	14,771	77,649
Net Revenue	$ 2,215	$10,567	$18,435
Non-Cash Expenses			
Owner-Operator Labor[3]	$1,735	$18,111	$14,800
Depreciation[4]	2,060	5,892	20,657
Total Non-Cash Expenses	$3,795	$24,003	$35,457
Net Income[5]	- $1,580	- $13,436	- $17,022

[1] Revenue derived from the sale of calves, yearlings, and cull cows.
[2] Cash costs include grazing fees, supplemental feed, veterinary expenses, marketing costs, labor costs, fuels and repairs, interest on operating capital, land taxes, farm overhead, insurance, and Federal and State taxes.
[3] Owner-operator labor is calculated at $3.70 per hour.
[4] Depreciation is calculated using the following formula:

$$\frac{\text{Present Cost} - \text{Salvage Value}}{\text{Estimated Life}}$$

[5] Net Income = Net Revenue - Non-Cash Expenses

Source: Hualapai-Aquarius PAA (BLM, 1980c).

Ranch Finance

The rancher's ability to borrow money is determined by many factors, including current assets, current liabilities, and the ranch's profitability.

The current market value of an AUM is estimated to be $125 or $1,500 per cow yearlong (Flake, 1980). Although BLM does not recognize the right to treat grazing permits as real property, these permits are bought and sold and used as collateral for loans.

On the basis of current allowable use, the value of the typical small ranch in the EIS area amounts to $131,625. The typical medium-size ranch is valued at $412,500, and the typical large ranch is valued at $1,394,750.

Regional Economics

Economic Study Area. Although the EIS area includes parts of Mohave and Yavapai Counties, its economic activity primarily affects Mohave County. Thus, Mohave County was chosen as the economic study area for this EIS.

Range Livestock-Related Receipts, Expenses, and Net Revenues. Total gross receipts from the sale of livestock for the 30 ranches in the EIS area amount to $1,279,540 (Table 3-13). Thus area ranchers earned 5.1 percent of the 1978 value of livestock and livestock products sold in Mohave County, which amounted to $24,815,000 (Arizona Crop and Livestock Reporting Service, 1980). Operating expenditures of the 30 EIS area ranches amount to $967,370, leaving a total net revenue of $312,170 (Table 3-13).

TABLE 3-13
TOTAL ANNUAL RANCH RECEIPTS, EXPENDITURES, AND REVENUE

Item	Ranch Size Small	Medium	Large	EIS Area Total
Number of Ranches	10	10	10	30
Receipts				
Per Ranch	$ 6,532	$ 25,338	$ 96,084	—
EIS Area Total*	65,320	253,380	960,840	$1,279,540
Expenditures*				
Per Ranch	4,317	14,771	77,649	—
EIS Area Total*	43,170	147,710	776,490	967,370
Net Return				
Per Ranch	2,215	10,567	18,435	—
EIS Area Total*	22,150	105,670	184,350	312,170

* Represents the per ranch figure multiplied by the number of ranchers in each size class.

Source: Hualapai-Aquarius PAA (BLM, 1980c).

Ranch labor requirements for the three typical ranches amounts to 47.77 workyears. Earnings from this employment amounts to $459,637, which represents 1.5 percent of the $30,000,000 earned in agricultural-related employment in Mohave County in 1978 (BLM, 1979d) (Table 3-14).

TABLE 3-14
RANCH EMPLOYMENT AND INCOME

Item	Ranch Size Small	Medium	Large	EIS Area Total
Number of Ranches	10	10	10	30
Paid Labor Requirements (Hours Per Year)[1]				
Per Ranch	469	3,415	8,538	
EIS Area Total	4,690	34,150	85,380	124,220
Employment (Workyears - 1 Workyear = 2,600 hours)[1 2]				
Per Ranch	.18	1.31	3.28	
EIS Area Total	1.80	13.13	32.84	47.77
Earnings ($9,620 per Workyear)[3]				
Per Ranch	$ 1,735	$ 12,602	$ 31,590	
EIS Area Total	17,353	126,378	315,906	$459,637

[1] Includes both family labor and hired labor.
[2] Workyears are calculated by dividing the hourly labor requirements by 2,600 hours; 1 workyear = 2,600 hours.
[3] Earning are calculated by multiplying estimated workyears by income per work year ($9,620). The product of multiplying workyears by workyear income does not equal income figures because workyears have been rounded.
[4] For the medium size class, the rancher does not have enough net revenue to pay the total family labor expense. The $10,567 net revenue thus accounts for only 58 percent of the family labor expense and the remaining 42 percent was excluded from the labor, employment, and income figure. To determine the total labor figure for this size class the paid family labor was added to the paid hired labor.

Construction and Recreation

According to the Lower Colorado Social-Economic Profile (BLM, 1979d), the construction industry provided $14,178,000 in earnings or 10 percent of Mohave County's total 1977 earnings. Recreation income is partially reflected in the wholesale and retail trade and services sector, which was the largest source of earnings in 1977, providing $38,651,000 or 27 percent of the county total.

Public Finance and Tax Base

In 1978 the assessed valuation of livestock operations in Mohave County amounted to less than 1 percent of the total county valuation of $202,754,985 (Arizona Office of Economic Planning and Development, 1980).

SOCIAL ATTITUDES AND VALUES

Descriptions and analyses of public attitudes in Mohave County appear in two previously published BLM EISs: the Cerbat/Black Mountain EIS (BLM, 1978c) and the Shivwits EIS (BLM, 1979c). Both EISs depict public attitudes in Mohave County as generally conservative, independent, and supportive of local control. "There is . . . a strong belief in the freedom of the individual to manage one's own affairs and determine one's future — a strong belief in local control and minimal governmental influence" (BLM, 1978c).

The validity of these observations was confirmed by information gathered in preparing this EIS. The information consisted of data from two sources. One source is a copyrighted market research survey conducted in Mohave County in September 1980 (RGL Enterprises, 1980), details of which are provided in Appendix 3-5. The second source is an informal conversational survey with Mohave County residents administered by a BLM social analyst in September and October 1980.

This new information provides data about the perceptions and attitudes of Mohave County residents toward a number of specific concerns and issues related to ranching and land management. The most relevant of these are summarized in the following discussion.

Public Land Activity Preferences

Mohave County residents broadly support a continuation of the traditional activities on public land. They have a high regard for outdoor recreation, ranching, mining, and wildlife. On the other hand, they do not consider wilderness designations important. According to the market research survey, over 75 percent of county residents consider outdoor recreation, ranching, and mining to be either "very important" or "important." More than half felt the same way about wildlife. But over 70 percent of the respondents rated wilderness as "not important."

Attitudes Toward Federal Land Management Agencies

Some items in the market research survey dealt with public attitudes toward BLM, the Forest Service, and the Park Service. Generally, the respondents indicated they were familiar with these agencies, and many had received their literature and attended their meetings. Others had read or heard television and radio comments about the agencies.

In response to questions about the "kind of job" these agencies had done in the past year, the residents were somewhat more critical than supportive. This critical view of the agencies appears to be based on a feeling that the agencies place little importance on local public opinions and concerns. For example, fewer than 20 percent of the respondents indicated that they felt any of these agencies gave enough importance to local public sentiments, and only 4 people out of every 10 surveyed felt that the agencies' responses to public opinions and concerns were at an acceptable level.

Local Government Preferences

Throughout Mohave County there is much interest in and support for the sagebrush rebellion. Not surprisingly, nearly all respondents to the market research survey were familiar with the rebellion. Of significance, however, is that 50 percent of those expressing opinions toward the rebellion favored it. This figure contrasts with findings reported by Behavioral Research Center, Inc. (1979). In a survey conducted in October 1979 in the western States this firm reported that only 34 percent of its respondents favored the sagebrush rebellion.

Several conclusions can be drawn from these data. First, Mohave County residents are aware of but not pleased with Federal land management in the county. Second, although public opinion strongly supports ranching, the residents feel Federal agencies have little regard for public opinion. Third, the apparent support for the sagebrush rebellion shows a public interest in making Federal agencies, particularly BLM, more accountable to local concerns, issues, and opinions.

CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

JUNIPER TREE

CHAPTER 4

ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

Chapter 4 analyzes the environmental consequences of the alternatives including the proposed action, analyzing each environmental component at a depth commensurate with the degree of expected impact. The EIS team determined that no measurable impacts would occur to geology, minerals, air quality, climate, topography, or urban land use, and these elements are not discussed in this chapter.

This section also identifies mitigating measures that may be selected by BLM decisionmakers to reduce or eliminate adverse environmental impacts. These measures would be applied in addition to those measures already made part of the proposal and described in Chapter 2.

BASIC ASSUMPTIONS

BLM made the following assumptions to aid in measuring the impacts of the alternatives.

1. BLM will have the personnel and funding necessary to implement the proposal or any alternative.

2. Alternatives selected will be fully implemented as described.

3. Monitoring and studies will be conducted as described. Use or management will be adjusted when studies show a need, consistent with applicable regulations.

4. Measures for resource protection and enhancement identified in Chapter 2 will be fully implemented.

5. Utilization of key forage in grazed pastures will not exceed an average of 50 percent under the proposed action, 45 percent under moderate grazing, and 40 percent under wildlife enhancement.

6. BLM acknowledges shortcomings in a 1-year (1978-1979) rangeland inventory. Without implemented AMPs or historical utilization and trend studies in the EIS area, however, the inventory data for vegetation condition, trend, production, and rangeland suitability are considered the most reliable existing data. As BLM receives new data from monitoring, studies, and other sources, it will make necessary adjustments, when called for, in grazing use or management.

7. Population estimates for big game and wild burros reflect the most current data available (AG&FD and BLM records). If future studies result in significant changes in these estimates, BLM will adjust vegetation allocations or management accordingly.

8. Short-term or temporary impacts would occur during implementation (1982 through 1987). Long-term impacts would occur 20 years after implementation is complete.

IMPACTS OF PROPOSED GRAZING MANAGEMENT

VEGETATION

This section discusses the impacts of vegetation allocation, minimum rest requirements, and rangeland developments on usable forage production, cover, ecological rangeland condition, and key species composition. In assessing impacts, rangeland specialists used existing data, professional judgment, and research results from comparable areas.

Usable Forage Production

Vegetation allocation adjustments and minimum rest periods under the proposed action are expected to increase usable forage production. The allocation process would ensure proper utilization of current annual growth, and the minimum rest requirement would allow undisturbed growth and development during critical growth periods. As a result, forage production would increase, and forage would have a chance to increase vigor, produce seed, accumulate litter, and provide for seedling establishment (Stoddart and Smith, 1955; Arizona Interagency Range Committee, 1973; Reardon and Merrill, 1976). Improved vigor and reproduction would enable forage plants to compete more favorably with nonforage plants.

Recent research suggests that the adjustments in forage allocation would be of greater significance than implementation of grazing systems in increasing vegetation production. In a review of pertinent literature, Van Poollen and Lacey (1979) found that annual herbage production increased 27 percent (plus or minus 13 percent) when grazing intensity was reduced

TABLE 4-1
IMPACTS ON USABLE FORAGE PRODUCTION[1]
(Air Dry Pounds)

Vegetation Type	Acres[2]	Percent of EIS Area	Average Usable Production per Acre					
			Existing	Proposed Action	No Action	Moderate Grazing	Wildlife Enhancement	Eliminate Livestock
Chaparral	81,486	9	184	216	172	208	216	190
Creosotebush	170,017	20	72	81	69	74	81	74
Desert Shrub	224,385	26	128	157	120	142	157	140
Grassland	68,988	8	157	218	106	196	218	195
Joshua Tree	21,426	3	116	126	101	122	126	121
Paloverde	194,298	22	96	105	89	99	105	96
Pinyon-Juniper	86,995	10	118	140	107	134	140	125
Ponderosa Pine	4,350	1	41	53	41	53	53	41
Riparian	4,804	1	165	185	153	163	212	212
AVERAGE			116	138	104	128	138	124

[1] Except for existing situation, values are for 20 years after implementation of alternative.
[2] Total acres in EIS area = 856,749.

from heavy to moderate and 35 percent (plus or minus 14 percent) when grazing intensity was reduced from moderate to light. Implementation of grazing systems resulted in a 13 percent (plus or minus 8 percent) increase in production. Thus, if livestock use is reduced from heavy to moderate levels at the same time a grazing system is implemented, the reduced allocation would be expected to account for 73 percent of the herbage response and grazing systems for 27 percent of the response.

Present usable forage production in pounds per acre was determined for each rangeland condition class in each vegetation type. Future usable forage production was projected by multiplying the acres of each projected rangeland condition class by the pounds of usable forage production determined for that rangeland condition class from the rangeland inventory.

For example, usable forage production in the Joshua tree vegetation type was determined to be 70 pounds per acre in areas of poor rangeland condition, 100 pounds per acre in areas of fair rangeland condition, 130 pounds in areas of good rangeland condition, and 160 pounds an acre in areas of excellent rangeland condition. An allotment with 1,000 acres of Joshua tree vegetation type in fair condition would thus produce 100,000 pounds of usable forage (1,000 acres × 100 pounds = 100,000 pounds of usable forage per acre). If all 1,000 acres were projected to be in good condition 20 years after implementation, then the Joshua tree vegetation type in this allotment would produce 130,000 pounds of usable forage. By calculating usable forage production for each vegetation type in each allotment, the total usable forage production can be determined.

As shown on Table 4-1, average usable forage production would increase from 116 to 138 pounds/acre/year in 20 years. The usable forage production of the grassland vegetation type would significantly increase (157 to 218 pounds per acre), since grasslands have an abundance of key species. In addition, insignificant changes are expected in the Joshua tree (116 to 126 pounds per acre), paloverde (96 to 105 pounds per acre), and creosotebush (72 to 81 pounds per acre) vegetation types.

Construction of rangeland developments would temporarily disturb 449 acres of vegetation and permanently disturb 228 acres of vegetation. The long-term loss of vegetation would result from the facilities replacing vegetation and from the trampling and grazing of livestock, big game, and wild burros on areas next to new waters. These losses, however, would be small in comparison to the increased benefits of lower utilization and improved vigor, composition, and production around existing waters.

Plant Cover

Change in vegetation cover is commonly used as one of the basic indicators of apparent trend in rangeland condition (Humphrey, 1962). Given a small change in cover, other indicators such as composition and reproduction will also show small changes in the same direction.

Predictions drawn from existing data for the EIS area indicate that plant cover of all plant species would not increase more than 3 percent (from 22 to 25 percent) (Table 4-2). Key species cover, however, would increase more than 3 percent, since components of the proposed action are directed toward increasing these species. "Changes in cover normally infer the same directional change in vegetation and plant succession" (Heady, 1967). The greatest change in cover would occur in the grassland vegetation type (18 to 24 percent), and the smallest change would occur in the chaparral (44 to 47 percent) and desert shrub (26 to 28 percent) types. Key species cover should increase, given the minimum rest requirement of grazing systems (Arizona Interagency Range Committee, 1973).

TABLE 4-2
PRESENT AND PROJECTED PLANT COVER[1]
(Percent of Ground Covered by Vegetation)

Vegetation Type	Existing Situation	Proposed Action	No Action	Moderate Management	Wildlife Enhancement	Eliminate Livestock
Chaparral	44	47	41	46	47	45
Creosotebush	14	16	12	15	16	14
Desert Shrub	26	28	24	27	28	27
Grassland	18	24	12	21	24	20
Joshua Tree	19	23	15	21	23	20
Paloverde	18	22	14	20	22	19
Pinyon-Juniper	22	25	19	24	25	23
Ponderosa Pine	34	38	30	36	38	35
Riparian	26	27	24	25	39	39
Average	22	25	19	24	25	23

[1] Except for the existing situation, values are for 20 years after implementation.

Rangeland Condition

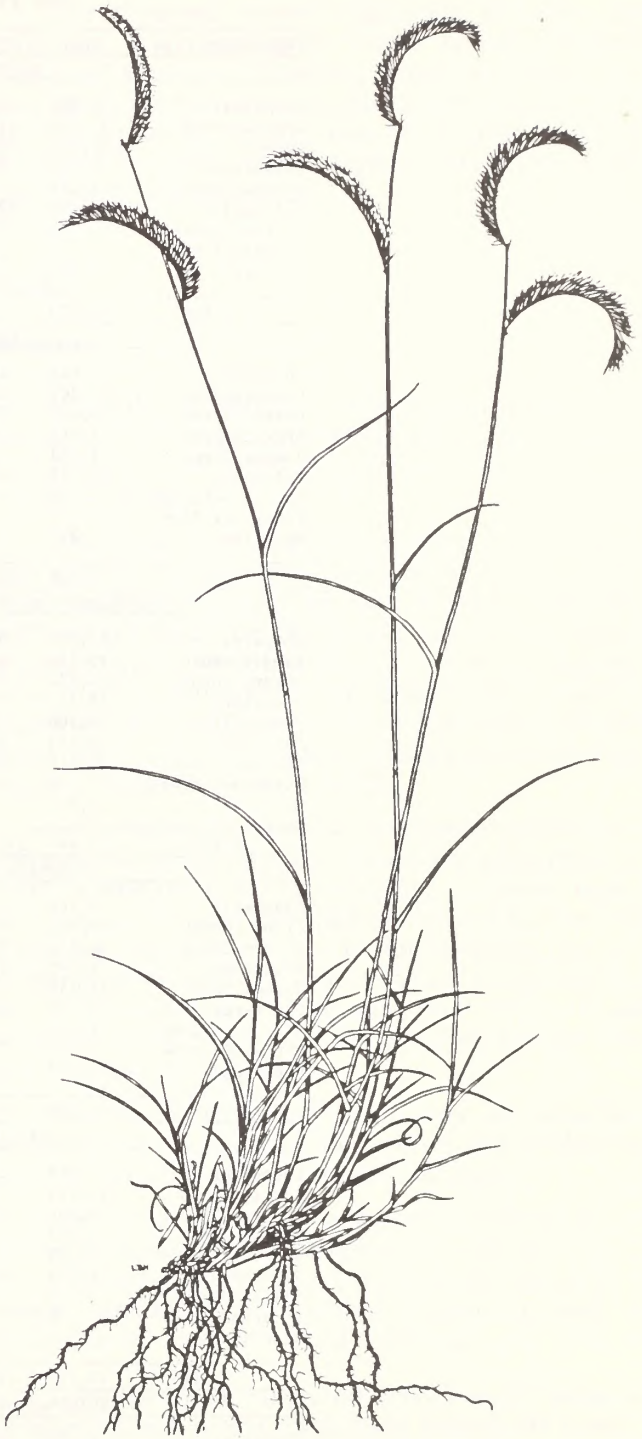
Rangeland condition would change over varying periods of time, depending on site potential, present plant cover, natural seed sources, extent of rangeland developments, climatic conditions, and level of grazing management. Areas with high productive potential should begin to improve within a few years, whereas less productive areas may require 20 years or more to show any improvement. And some areas are expected to remain unchanged. (See methodology described in Appendix 1-1).

Rangeland condition would improve because proper grazing use affects key forage plants in the following ways: increases or maintains vigor, enhances seedling establishment, and causes an eventual thickening of the stand (Anderson, 1969).

Reynolds and Martin (1968) reported that sustained high production of perennial grass requires grazing of desirable plants to the proper degree at appropriate times as well as the optimum distribution of livestock.

Areas in excellent rangeland condition would increase from 20,724 to 247,279 acres, and areas in good rangeland condition would increase from 280,791 to 415,407 acres. Areas in fair condition would decrease from 466,231 to 142,340 acres, and areas in poor condition would decrease from 89,003 to 51,723 acres. Projected rangeland condition acreage by vegetation type is shown in Table 4-3 and by allotment in Appendix 4-1.

In the EIS area, percent key species composition of each vegetation type and condition class increases as rangeland condition improves. This relationship is based on the rangeland condition and vegetation inventory data accumulated during the survey (Table 4-4). Within the EIS area, key species composition would increase from 22 to 30 percent on 226,555 acres improving from good to excellent condition. On 134,616 acres improving from fair to good condition, key species composition would increase from 15 to 22 percent. The key species composition of the 142,340 acres in fair condition would remain at 15 percent, and the key species composition of 51,723 acres in poor condition would remain at 8 percent.



Blue Grama

TABLE 4-3
EXISTING AND PROJECTED RANGELAND CONDITION
ON PUBLIC LANDS[1]

Vegetation Type	Poor	Fair	Good	Excellent	Total Acres
EXISTING SITUATION					
Chaparral	8,398	44,712	26,194	2,182	81,486
Creosotebush	24,974	112,300	28,824	3,919	170,017
Desert Shrub	22,027	101,836	91,521	9,001	224,385
Grassland	2,064	26,616	40,079	229	68,988
Joshua Tree	11,131	975	4,011	5,309	21,426
Paloverde	16,796	125,682	51,736	84	194,298
Pinyon-Juniper	708	47,898	38,389	0	86,995
Ponderosa Pine	0	4,350	0	0	4,350
Riparian	2,905	1,862	37	0	4,804
TOTALS	89,003	466,231	280,791	20,724	856,749
PROPOSED ACTION					
Chaparral	668	11,209	41,673	27,936	81,486
Creosotebush	22,263	33,585	98,988	15,181	170,017
Desert Shrub	6,450	38,982	85,190	93,763	224,385
Grassland	2,912	5,352	23,301	37,423	68,988
Joshua Tree	9,053	2,078	975	9,320	21,426
Paloverde	10,167	44,745	112,979	26,407	194,298
Pinyon-Juniper	0	1,958	47,825	37,212	86,995
Ponderosa Pine	0	0	4,350	0	4,350
Riparian	210	4,431	126	37	4,804
TOTALS	51,723	142,340	415,407	247,279	856,749
CONTINUATION OF PRESENT GRAZING MANAGEMENT					
Chaparral	19,486	41,576	19,278	1,146	81,486
Creosotebush	95,788	63,291	7,019	3,919	170,017
Desert Shrub	105,722	51,547	61,137	5,979	224,385
Grassland	18,402	39,067	11,369	150	68,988
Joshua Tree	12,106	4,011	5,309	0	21,426
Paloverde	130,711	57,834	5,753	0	194,298
Pinyon-Juniper	26,616	34,337	26,042	0	86,995
Ponderosa Pine	0	4,350	0	0	4,350
Riparian	4,767	37	0	0	4,804
TOTALS	413,598	296,050	135,907	11,194	856,749
MODERATE GRAZING MANAGEMENT					
Chaparral	9,161	5,264	39,239	27,822	81,486
Creosotebush	33,031	83,560	47,832	5,594	170,017
Desert Shrub	32,214	73,542	50,216	68,413	224,385
Grassland	6,090	12,285	24,308	26,305	68,988
Joshua Tree	11,131	975	180	9,140	21,426
Paloverde	30,087	81,995	68,927	13,289	194,298
Pinyon-Juniper	1,398	7,283	52,575	25,739	86,995
Ponderosa Pine	0	0	4,350	0	4,350
Riparian	3,197	1,570	0	37	4,804
TOTALS	126,309	266,474	287,627	176,339	856,749
WILDLIFE ENHANCEMENT					
Chaparral	668	11,209	41,673	27,936	81,486
Creosotebush	22,263	33,585	98,988	15,181	170,017
Desert Shrub	6,450	38,982	85,190	93,763	224,385
Grassland	2,912	5,352	23,301	37,423	68,988
Joshua Tree	9,053	2,078	975	9,320	21,426
Paloverde	10,377	48,966	108,674	26,281	194,298
Pinyon-Juniper	0	1,958	47,825	37,212	86,995
Ponderosa Pine	0	0	4,350	0	4,350
Riparian	0	210	4,431	163	4,804
TOTALS	51,723	142,340	415,407	247,279	856,749
ELIMINATION OF LIVESTOCK GRAZING					
Chaparral	8,370	42,901	2,393	27,822	81,486
Creosotebush	24,974	90,974	48,475	5,594	170,017
Desert Shrub	22,027	98,059	33,552	70,747	224,385
Grassland	2,064	20,738	18,067	28,119	68,988
Joshua Tree	11,131	975	180	9,140	21,426
Paloverde	19,697	124,836	36,641	13,124	194,298
Pinyon-Juniper	708	47,172	12,199	26,916	86,995
Ponderosa Pine	0	4,350	0	0	4,350
Riparian	0	210	4,431	163	4,804
TOTALS	88,971	430,215	155,938	181,625	856,749

[1] Except for the existing situation, values are for 20 years after implementation.

TABLE 4-4
PERCENT KEY SPECIES COMPOSITION
VEGETATION TYPE AND RANGELAND CONDITION

Vegetation Type	Rangeland Condition			
	Poor	Fair	Good	Excellent
Chaparral	16	23	33	43
Creosotebush	3	6	12	13
Desert Shrub	7	15	21	34
Grassland	15	31	34	47
Joshua Tree	13	23	29	35
Paloverde	2	10	14	29
Pinyon-Juniper	7	12	21	26
Ponderosa Pine	6	10	26	34
Riparian	2	4	6	11
Average	8	15	22	30

Riparian Vegetation

Forage utilization would decline as a result of the vegetation allocation, but livestock would continue to heavily graze riparian areas and heavily utilize desirable riparian vegetation, such as willows and grasses. The minimum rest periods of grazing systems would be sufficient to improve herbaceous vegetation. Periodic heavy livestock use and continuous heavy use by wildlife and burros, however, would prevent major long-term improvement.

Where rangeland developments have improved livestock distribution and reduced grazing pressure in riparian areas, the cumulative impacts of rangeland developments, vegetation allocation, and the minimum rest requirement would slightly improve vigor and increase reproduction of herbaceous plants. Woody plants, though, would continue to be grazed too heavily to reproduce.

During years of abundant ephemeral vegetation, the number of livestock grazed would exceed the carrying capacity based on perennial vegetation. If livestock are not removed once ephemeral vegetation cures and is no longer succulent, they would congregate near riparian areas, overgrazing riparian vegetation.

Usable forage production would increase slightly from 165 to 185 pounds per acre, and cover would increase from 26 to 27 percent. Range condition would change as follows: excellent from 0 to 37 acres, good from 37 to 126 acres, fair from 1,862 to 4,431 acres, and poor from 2,905 to 210 acres. Key species composition would correspondingly increase as acreage in excellent, good, and fair condition increases. Key species composition would remain the same in areas remaining in poor condition.

Protected Plants

The proposed action's vegetation allocation and minimum rest requirement would benefit protected plants by lowering utilization, improving plant vigor, and increasing reproduction. Moreover, onsite field examinations before construction of rangeland developments would assure that endangered, threatened, or sensitive plants are protected.

SOILS

Erosion

With the exception of allotments proposed for nonintensive management (20,226 acres), the proposed action would reduce soil compaction, soil erosion, and sediment yield.

The 9,384 acres in a critical-severe erosion condition and the 97,523 acres in a moderate erosion condition would improve over the next 20 years. These projections are based on the future soil surface factors estimated during the BLM rangeland inventory and erosion studies conducted by the Science and Education Administration (USDA) at the Walnut Gulch Experiment Station in southeastern Arizona (Arizona Inter-Agency Range Committee, 1972).

Soil erosion condition would improve primarily in response to the reduction of livestock grazing pressure, which would result in less trampling, increased vegetation production, and increased total ground cover. (See Table 4-5, Impacts on Soils.) In riparian areas, soils in a moderate to critical erosion condition would improve due to decreased grazing pressure from livestock and wild burros where grazing systems allow adequate rest and recovery of vegetation.

Decreased forage production over the long term would result in increased soil erosion and further impacts to the soils on nonintensive allotments.

Finer textured soils in the EIS area, such as Springerville, Cabezon, and Thunderbird (soil association 13—Grassland soils), would respond the most to increased ground cover, reduced compaction, and increased water infiltration and retention.

Construction of rangeland developments under the proposed action would temporarily disturb 449 acres of soil and permanently occupy 228 acres. The plants and soils disturbed would need an estimated 3- to 10-year period to recover (BLM, 1978b). The major impact to the soil would be the 228 acres permanently lost to rangeland developments, but this acreage is insignificant compared to the total EIS area. During the construction and recovery period, soil compaction and the removal of ground cover would increase erosion. But as vegetation and litter increase, soil erosion would

TABLE 4-5
IMPACTS ON SOILS

Grazing Management	Number of Allotments	Acres	Changes In[1] Ground Cover and Litter	Organic Matter and Fertility	Soil Compaction	Water Infiltration	Sediment Yield[2] ac-ft/mi^2/year
PROPOSED ACTION							
Cool- and Warm-Season Deferment/Rest	16	526,696	Increase	Increase	Decrease	Increase	Negligible Decrease 0.01
Warm-Season Deferment/Rest	12	249,994	Increase	Increase	Decrease	Increase	Negligible Decrease 0.01
Less Intensive Management	4	8,780	Increase	Increase	Decrease	Increase	Negligible Decrease 0.01
Ephemeral	4	51,053	Increase	Increase	Decrease	Increase	Negligible
Nonintensive	15	20,226	Decrease	Decrease	Increase	Decrease	Negligible Increase < 0.01
CONTINUATION OF PRESENT GRAZING MANAGEMENT							
Yearlong	32	799,996	Decrease	Decrease	Increase	Decrease	Slight Increase 0.03
Ephemeral	2	10,997	No Change	No Change	No Change	No Change	Negligible
Nonintensive	14	45,756	Decrease	Decrease	Increase	Decrease	Negligible Increase < 0.01
MODERATE GRAZING MANAGEMENT							
Perennial-Ephemeral	32	785,470	Increase	Increase	Decrease	Increase	Negligible Decrease 0.01
Ephemeral	4	51,053	Increase	Increase	Decrease	Increase	Negligible Decrease 0.01
Nonintensive	15	20,226	Decrease	Decrease	Increase	Decrease	Negligible Increase < 0.01
WILDLIFE ENHANCEMENT							
Perennial-Ephemeral	27	776,690	Increase	Increase	Decrease	Increase	Negligible Decrease 0.01
Less Intensive	4	8,780	Increase	Increase	Decrease	Increase	Negligible Decrease 0.01
Ephemeral	4	51,053	Increase	Increase	Decrease	Increase	Negligible Decrease 0.01
Nonintensive	15	20,226	Decrease	Decrease	Increase	Decrease	Negligible Increase < 0.01
ELIMINATION OF LIVESTOCK GRAZING							
No Livestock Grazing	All Public Lands	857,749	Increase	Increase	Decrease	Increase	Slight Decrease 0.03

[1] Projections are based on the Walnut Gulch Experiment Station watershed studies in southeastern Arizona (Arizona Inter-Agency Range Committee, 1972).

[2] Data used for sediment yield calculations were obtained from existing soils (SCS, 1976b; BLM, 1979a;b) and watershed inventories (BLM, 1974-1975).

decline. The short-term and long-term impacts—increased erosion and decreased ground cover—would be insignificant when compared to the total soil erosion in the EIS area. See Table 4-6, Soil Impacts—Rangeland Developments.

TABLE 4-6
SOIL IMPACTS--RANGELAND DEVELOPMENTS

Grazing Management	Acreage Disturbed			
	Temporary	Percent of EIS Area	Permanent	Percent of EIS Area
Proposed Action	449 Acres	0.052	228 Acres	0.027
No Action	204 Acres	0.024	111 Acres	0.013
Moderate Management	204 Acres	0.024	111 Acres	0.013
Wildlife Enhancement	392 Acres	0.045	197 Acres	0.022
Eliminate Livestock	743 Acres	0.087	156 Acres	0.018

Sediment Yield

Of the nine factors evaluated to estimate sediment yield, three are subject to change under the various grazing alternatives: ground cover, land use (livestock grazing), and upland erosion. Under the proposed action, ground cover would increase and livestock grazing and upland erosion would decrease, resulting in a net sediment yield decrease of 0.01 acre-feet/square mile/year. As shown in Table 4-7, sediment yield on some associations would increase and on others would decrease or remain stable. Generally, associations whose sediment yield would increase or remain stable occur on nonintensive allotments where grazing is expected to remain heavy or where changes in the cover, land use, or erosion would be insignificant.

TABLE 4-7
SEDIMENT YIELD BY ALTERNATIVE[1]
(in Acre-Feet/Square Mile/Year)

Soil Association	Existing Situation	Proposed Action	No Action	Moderate Management	Wildlife Enhancement	Eliminate Livestock
1	0.33	0.30	0.36	0.31	0.30	0.30
2	0.37	0.36	0.42	0.37	0.36	0.35
3	0.36	0.34	0.40	0.34	0.34	0.33
4	0.28	0.28	0.30	0.28	0.28	0.26
5	0.31	0.29	0.35	0.30	0.29	0.29
6	0.34	0.34	0.38	0.34	0.34	0.31
7	0.33	0.31	0.35	0.30	0.31	0.29
8	0.34	0.31	0.36	0.31	0.31	0.30
9	0.30	0.30	0.33	0.30	0.30	0.26
10	0.35	0.35	0.37	0.35	0.35	0.33
11	0.26	0.26	0.28	0.26	0.26	0.24
12	0.24	0.26	0.27	0.26	0.26	0.20
13	0.24	0.25	0.26	0.25	0.25	0.21
14	0.33	0.30	0.35	0.31	0.30	0.30
Weighted Average	0.33	0.32	0.36	0.32	0.32	0.30

[1] Projections are for 20 years after implementation.

WATER RESOURCES

Water Quantity

Local surface water quantity is expected to slightly decrease as a result of decreased runoff and increased consumption of water developed under the proposed action. Storage facilities would increase the storage capacity by 49.5 acre-feet. Consumption would increase by 11 acre-feet to 50 acre-feet for burros, livestock, and big game.

Runoff is expected to decrease as infiltration increases. Increased infiltration would result from increased cover (Lyford and Qashu, 1969; Branson, Gifford, and Owen, 1972) and greater soil moisture deficits (see Glossary) caused by increased vegetation (Cable, 1980).

Because transpiring vegetation consumes more soil moisture than evaporation from bare ground (Cable, 1980), the decrease in soil moisture storage would reduce the probabilities of high soil moisture and reduce the size and frequency of floods. Measurable impacts to runoff and infiltration would occur only in the long term after reduced grazing pressure and periods of rest result in increased vegetation and reduced soil moisture. These impacts might be significant only on the small watershed scale.

Under the proposed action, 19 new wells with a combined storage of 1.0 acre-foot would reduce ground water insignificantly.

Water Quality

The proposed action would likely impact the levels of fecal coliform bacteria, sediment, and nutrients (Moore and others, 1979) but not affect other pollutants described in Chapter 3. Fecal coliform are associated with the gut of warm blooded animals, indicating the presence of pathogenic organisms in a water source. Although fecal coliforms have been related to livestock grazing, wildlife are also a potential fecal coliform source (Moore and others, 1979). The increase in wildlife may partially offset the water quality benefits of reduced livestock under the proposed action. Because cattle prefer riparian zones (Platts, 1979), the fewer cattle may not reduce the concentration of use in these areas. Increased big-game and selective livestock grazing might increase fecal coliform in the area's streams unless areas along streams are rested from grazing.

Sediment in streams would be reduced if areas along streams are rested from grazing. Otherwise, con-

centrated grazing along streams would reduce the benefits of decreased grazing intensities.

The proposed action would reduce nutrient pollutants as animal contact with streams declines. The impacts on nutrients would depend on whether areas along streams receive rest.

The proposed action would not affect ground water quality if wells are properly located and designed so as not to receive runoff from areas of concentrated animal use.

WILDLIFE

This section analyzes the impacts of the proposed action on wildlife habitat components—food, water, cover, and space. It evaluates the probable impact of grazing management (utilization, treatments, and rangeland developments) on vegetation and reveals the extent and degree of grazing impacts on wildlife.

The effects of livestock and burro grazing on wildlife and its habitat are complex, involving many interrelationships that are not clearly understood. Impacts are thus discussed by specific wildlife groups, except where data exist for individual species. Table 4-8 rates the impacts on the proposed action on wildlife and its habitat. The analysis addresses specific impacts to wildlife and habitat on public lands only.

Grazing Adjustments

Livestock stocking would be changed on all but two allotments—both ephemeral—and burro numbers would be reduced. Adjusting livestock and burro numbers and maintaining present big-game numbers would reduce competition among forage users and bring grazing in line with the carrying capacity of the rangeland.

Big Game

In the long term, the forage productivity of elk habitat would increase by 27 percent in the Hualapai Peak and Yellow Pine allotments, mostly on perennial grasses and forbs used by both elk and cattle. Based on percent change, the increase was determined using future forage production estimates found in Appendix 2-3. Over 17,000 acres would improve beyond the fair range condition class, in the long term resulting in less forage competition. Cattle and elk would compete less for space because of short-term reductions. Even as livestock numbers increase in the long term, less spatial competition would occur than at present. In the long term, forage would be available for 26 elk on public lands (Table 4-9).

The forage productivity of mule deer habitat would increase 19 percent on the following allotments: Artillery Range, Big Sandy, Boriana, Burro Creek Ranch, Francis Creek, Groom Peak, Hualapai Peak, and Kent's Cane Spring. Competition for forage and space would greatly decline in the short term (Hawkes and Furlow, 1978), since over 360,000 acres of deer habitat would improve to good and excellent rangeland condition classes. In the long term, forage would increase enough to support 740 more deer.

The forage production of pronghorn antelope habitat would increase by 29 percent. The large productivity increase on the Francis Creek allotment, however, would be offset by continued declines on the Sweetmilk allotment, where habitat would continue to deteriorate. On Francis Creek and McElhaney allotments, cattle and pronghorn would compete less for forage. Pronghorn requirements for space and cover would be only partially met by the average 50 percent utilization of grasses and forbs. In the long term, however, cover would increase by 33 percent. Also in the long term, habitat improvement due to initial decreases in livestock would increase forage to allow for an additional 44 pronghorn.

The forage productivity of desert bighorn sheep habitat would increase by 13 percent in the long term, reducing competition for forage and space among bighorn sheep, cattle, and wild burros. Over 26,000 acres would improve from poor and fair to good and excellent condition, allowing bighorn to use more of the Artillery Range, Bateman Spring, and Chicken Springs allotments. Increased forage would make the foothills more usable by bighorn. In the long term, forage would increase enough to support 11 more bighorn sheep.

Javelina would continue to increase in numbers and become better distributed throughout the EIS area. Reduced forage competition among all users would allow javelina to increase by over 1,000 animals in the long term.

Other Wildlife

Increases in grass and forb cover (Table 4-2) would be offset by continued livestock disturbance in riparian habitat and at water sources, which would reduce woody plant cover by 8 percent over 20 years (Hughes, 1978). The overall change would be toward deteriorated waterfowl and shorebird habitat.

The productivity of upland and small-game habitat would increase by 19 percent in the long term. Gambel's quail populations would fluctuate less than at present, and populations during high rainfall years could be higher than at present. Band-tailed pigeons would increase due to lower utilization (50 percent) of plants and to increases in mast and fruit-producing shrubs. Mourn-

TABLE 4-8
WILDLIFE AND HABITAT IMPACT RATINGS UNDER THE PROPOSED ACTION[1]

Alternative's Features	Big Game					Special Status Species				
	Mule Deer	Elk	Bighorn Sheep	Pronghorn Antelope	Javelina	Federal-Listed Threatened/ Endangered Species	Other Protected Species[2]	Upland and Small Game	Nongame Wildlife	Riparian Habitats
Grazing Use										
Vegetation Production Available Initially	3	3	3	3	3	3	3	3	3	3
Vegetation Production Available in 5 years	4	4	3	4	4	3	4	4	4	2
Vegetation Production Available in 20 years	4	5	4	5	4	3	4	4	4	2
Levels of Grazing Management										
Intensive	4	4	4	4	4	3	3	4	3	3
Less Intensive	4	NA	NA	NA	3	4	4	4	4	2
Nonintensive	2	NA	NA	NA	3	3	2	3	2	2
Ephemeral	4	NA	NA	NA	3	4	4	4	4	3
Management Facilities										
Water Developments	4	4	4	4	4	NA	4	4	4	2
Fencing	3	2	2	2	3	NA	NA	NA	NA	NA
Totals (Average)	3.6	3.7	3.3	3.7	3.4	3.3	3.5	3.8	3.5	2.4
	Average Rating for Alternative 3.4					Average Rating for Existing Situation 2.5				

[1] The rating system is as follows: 1 = most significant downward trend; 2 = downward trend; 3 = relatively static; 4 = upward trend, 5 = most significant upward trend; NA = not applicable.

[2] Proposed threatened or endangered species, State-listed species, BLM sensitive species.

ing dove populations would increase slightly due to a lessening of nest disturbance by livestock, especially where doves ground-nest. On the other hand, white-winged dove habitat would continue to decrease with the continued 8 percent long-term deterioration of riparian plant cover. The adverse impact to white-wings would be greater than that evidenced by cover deterioration alone (BLM, 1980a).

Desert cottontail and jackrabbit populations would probably not significantly change, except on the Chicken Springs and La Cienega allotments, where populations might decrease and fluctuate less (Peck, 1979).

Nongame habitat would notably change under the proposed action. The 19 percent increase in forage production, 14 percent increase in plant cover, 25 percent increase in grass heights, and decreased competition among perennial forage users would primarily affect the lower layers of vegetation needed for cover by many nongame species. Habitat with sufficient low-level ground cover would increase by 187 percent, leaving only 193,000 acres in the EIS area lacking this ground cover.

The quality of nongame riparian habitat would continue to decline with the loss of riparian trees (BLM, 1979c). This long-term impact would offset benefits to other nongame habitat, although data do not exist for direct comparisons. Riparian habitat conditions would remain far below their potential.

Protected and Sensitive Species

Protected and sensitive wildlife habitat would continue to degrade for some species but improve for most others. Aquatic and riparian bald eagle habitat would decline in productivity. Roost trees would be fewer, and prey populations would decline due to reduced water quality and quantity (Kepner, 1979) and reduced riparian habitat quality. Bald eages could cease to winter in the EIS area. Potential peregrine falcon habitat would continue to exist but with small likelihood of supporting breeding pairs in the long term.

In the long term, forage productivity would increase by 17 percent in desert tortoise habitat. In the short term, competition between the tortoise and other forage users would slightly decline on winter-spring annuals, which would increase desert tortoise reproduction. The populations should improve slightly in the long term.

Bell's vireo habitat would not significantly change.

TABLE 4-9
PROJECTED BIG-GAME NUMBERS
20 YEARS AFTER IMPLEMENTATION[1,2]

Species	Present	Proposed Action	No Action	Moderate Management	Wildlife Enhancement	Eliminate Livestock
Mule Deer	2,687 (4,554)	3,427 (5,808)	2,150 (3,644)	3,384 (5,736)	4,091 (6,934)	3,384 (5,736)
Pronghorn Antelope	81 (202)	125 (313)	65 (163)	95 (238)	150 (375)	95 (238)
Elk	16 (20)	26 (32)	12 (15)	26 (32)	30 (37)	26 (32)
Desert Bighorn	19 (20)	30 (32)	17 (18)	30 (32)	40 (42)	30 (32)
Javelina	154 (342)	1,214 (2,023)	200 (333)	1,214 (2,023)	1,214 (2,023)	1,214 (2,023)

[1] Numbers not in parentheses represent big game on public lands; numbers within parenthesis represent total big game within EIS area.

[2] Projections are based on forage made available to big game and on the assumption that no other factors would limit population growth.

Black Hawk populations would remain the same in the short term. In the long term, black hawk habitat and populations would begin a sharp decline as nest trees die off, removing suitable nesting habitat. By the end of the 20-year period, black hawks would be nearly eliminated from the EIS area. Cumulative effects from mining operations and other actions in the Burro Creek drainage could worsen short-term and long-term impacts.

The proposed action would less adversely affect zone-tailed hawks than black hawks because of the zone-tailed hawk's wider foraging and breeding distribution. In the long term zone-tailed numbers would decrease as suitable nest trees near unprotected springs and along riparian drainages become increasingly scarce.

Great egrets, snowy egrets, and black-crowned night herons would continue to use denuded areas around stock tanks, Alamo Lake, and sections of Burro Creek and the Big Sandy River as stopovers during migration but would probably not breed in the EIS area because cover would be lacking.

Giblert's skink populations would increase in the long term, primarily due to an 8 percent increase in plant cover in their preferred habitats.

The quality of Gila monster habitat would improve, primarily due to increases in prey base. Prey would increase as a result of a 10 percent increase in plant cover from the present.

The Sonoran mountain kingsnake population would increase as its prey base increases. The kingsnake's prey in turn would increase as a result of the 13 percent increase in plant cover in the pinyon-juniper and ponderosa pine vegetation types.

The Hualapai vole would benefit from increased food and cover plants. Cover would improve by 12 percent, although the amount of cover would be on the low end of the vole's apparent requirements. An average utilization of 50 percent would be too high to keep the grasses and forbs at the preferred cover height of 10 to 14 inches. The proposed action would protect the vole population from extinction and would probably keep the vole off the State "threatened" list.

The ferruginous hawk would continue to winter in the planning area and might breed due to an improved grassland aspect over 20,000 acres of habitat.

Riparian Habitat

Riparian habitat quality would not improve due to continued heavy grazing on the palatable vegetation along water courses (Platts, 1979). Although 127 acres (2 percent of the riparian vegetation) would rise above fair rangeland condition in the long term, young cottonwood, willow, and ash trees would not become established to replace old trees (BLM, 1979c; Hughes, 1978). Apparent trends in riparian rangeland condition are similar to trends in riparian habitat quality. Trend is currently about 50 percent static and 50 percent downward (Table 3-1). Without an upward shift in that trend, dependent wildlife populations might no longer inhabit the EIS area or would be greatly reduced. Components of the proposed action alone would thus not ensure that BLM's objectives (BLM Manual 6740; Almand and Krohn, 1978) for protection and improvement of riparian ecosystems are fully met.

Management

Grazing treatments would have beneficial and adverse impacts on wildlife. The proposed action would designate two additional allotments (Chino Springs and Alamo Crossing) as ephemeral, allowing almost total rest on perennial forage on over 40,000 acres. In addition, on 16 allotments (Table 2-3) each pasture would be rested from livestock grazing 16 months out of 4 years. On 12 allotments, each pasture would be rested for 14.5 months out of 4 years. Besides decreasing competition during periods of rest, these actions would improve wildlife cover and available forage.

The perennial-ephemeral designation, however, would adversely affect habitat in 24 allotments, where additional livestock would be allowed to graze pastures when sufficient growth of annuals occurs. These additional livestock would increase wildlife-livestock competition, an important impact because wildlife use these productive annual blooms to provide energy for reproduction.

Significant habitat improvement cannot be predicted for rest treatments on intensively managed allotments under the proposed action. Because different systems have different affects (BLM, 1979c), impacts cannot be projected until allotment management plans with specific treatments and systems are developed. Rest, however, would temporarily increase forage and cover for wildlife in some areas.

Intensive Management would have the following general impacts on wildlife.

(1) Rest periods would free elk from competing with cattle for forage in the short and long term.

(2) Mule deer habitat would be rested in a patchwork pattern throughout the EIS area, providing plenty of forage for deer in at least one pasture per allotment. Mule deer would probably not fully use all the rested pastures since they are creatures of habit and seem reluctant to move into new areas.

(3) Pronghorn antelope would proably benefit the most from rested pastures on Goodwin and Bozarth Mesas in the Francis Creek and McElhaney allotments. Cover and food would greatly increase on these grasslands during rest, partly and temporarily alleviating the limiting factors for pronghorn. The benefits of rest would begin in the short term and last through the long term.

(4) Desert bighorn sheep would benefit from rested pastures less than other big game because of the limited distribution of bighorn. Bighorn sheep behavioral traits are similar to those of deer, and bighorn may not take advantage of changing rested pastures.

(5) Javelina would benefit by using rested pastures in the short term. They would also benefit from the long-term increase in production expected from the grazing treatments.

(6) Waterfowl and shorebirds would not be significantly affected by the grazing treatments.

(7) Upland and small game would take advantage of ungrazed habitat 1 in every 4 years. Rest from grazing would somewhat alleviate competition for food and space in the short term and increase necessary cover in the long term. Grazing treatments would not significantly affect white-winged doves.

(8) Nongame would temporarily benefit in each pasture during rest 1 year out of 4. Cover would be more abundant during the rest period, and nest-trampling and forage competition would be reduced.

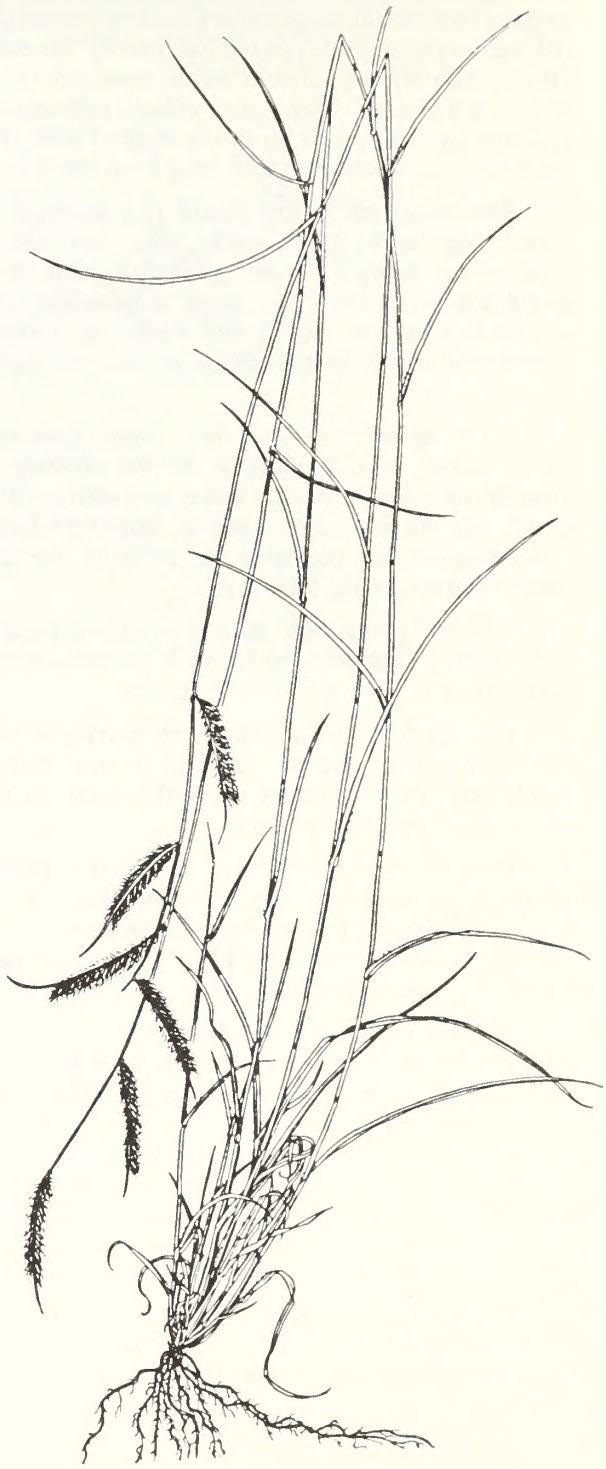
(9) Grazing treatments would not significantly affect the bald eagle, peregrine falcon, or Bell's vireo but would affect the desert tortoise. Over 113,000 acres of desert tortoise crucial habitat (Map 2-2) on perennial-ephemeral allotments would not only undergo yearlong grazing but would also undergo supplemental livestock grazing during ephemeral blooms. Though the intention of ephemeral grazing is to allow only 50 percent utilization of ephemeral plants, estimates of carrying capacity and duration of ephemerals can easily be in error. Ephemerals could be overused, especially in lusher swales where tortoises tend to congregate. Competition for forage and trampling of young tortoises would result (Berry, 1978).

In desert tortoise crucial habitat, sufficient winter-spring ephemeral forage is necessary to allow populations to reproduce and remain viable. Individual tortoises cannot range widely (to another pasture) to procure forage. Decreases in forage through livestock grazing during winter and spring creates an artificial drought, causing the tortoise to lose weight and experience lowered reproduction (Berry, 1978). Since ephemeral forage is not dependable, further human manipulation could disrupt wildlife dependent on such forage.

The black and zone-tailed hawks would not directly benefit from rest treatments but would benefit indirectly through small increases in their prey base.

Rest periods would benefit the Gilbert's skink, Gila monster, and Sonoran mountain kingsnake in the short term by increasing cover and possibly increasing prey.

Great egrets, snowy egrets, and black-crowned night herons would not benefit from proposed grazing treatments.



Hairy Grama

The Hualapai vole and the desert night lizard would directly benefit from rest treatments, the Hualapai vole more than the night lizard. Both would benefit from the 14+ months of rest, which would increase cover and food availability once every 4 years.

(10) Despite rest treatments, riparian habitat quality would continue to decline along present trends (50 percent downward, 50 percent static). The 2.75 years of high-utilization livestock grazing between rest periods would not allow the several years needed for seedlings of favored woody plants—cottonwood, Gooding willow, and velvet ash—(Martin, 1979) to grow to heights beyond the reach of livestock (BLM, 1979c).

Less intensive management on four allotments covering 8,780 acres would provide for yearlong grazing and no rest treatments. The impact of this management on wildlife would be negligible. Rangeland condition would remain essentially unchanged. Small increases in litter, cover, and plant vigor would slightly benefit nongame, and increased plant vigor would increase forage for big game by less than 5 percent.

Nonintensive grazing management on over 20,000 acres would provide for yearlong grazing and no rest treatments and would decrease by 8 percent the forage production on the 15 nonintensive allotments or portions of allotments. Wildlife habitat would generally continue to decline on these allotments.

Ephemeral grazing management on four allotments covering 47,417 acres would greatly benefit perennial vegetation, since in most years the land would be effectively rested from livestock use from June through January. Conflicts with the desert tortoise are not expected to be significant, since the four allotments have no crucial desert tortoise habitat. Wildlife would otherwise be impacted the same as by rest treatments under intensive management, except benefits would be greater due to more frequent rest.

Rangeland Developments

The proposed action calls for numerous rangeland developments, which would permanently remove 228 acres of habitat from production. Two types of facilities are proposed: water developments and fences.

Waters

Over 160 water developments are proposed for all intensively managed grazing allotments (Table 2-5). Of these, 147 are expected to provide year-round water. With BLM's standard protection around waters (see Chapter 2, Measures for Resource Protection and Enhancement), about 5,600 acres would deteriorate around the developments, forming disturbed areas. Disturbed areas are denuded land caused by forage overuse, trampling, and trailing in an average 750-foot radius from a water (BLM, 1979c).

Increased water availability should be a boon to several species, as water is a primary limiting factor to habitat quality in much of the desert covering 71 percent of the planning area. The increase in water, however, would also increase competition for some species.

Water does not presently limit elk in the EIS area. New livestock waters would have no significant impacts, except that an increase of eight waters would reduce spatial competition from cattle.

Additional waters in mule deer habitat would benefit deer by expanding their ability to forage in new areas. On the other hand, 60 water developments would significantly extend the range of livestock into areas that have previously been only lightly grazed. As a result, livestock-deer competition for browse and space would increase, and cover would decrease. The reduction in cover on intensively managed allotments would be temporary.

Pronghorn antelope would slightly benefit from six waters in new areas. The increased area used by livestock in crucial pronghorn habitat would have substantial short-term and long-term adverse impacts on forage and cover.

Bighorn sheep would be adversely impacted by six new livestock waters, which would increase competition with cattle for forage and space.

Increased water availability would benefit javelina by increasing the size of their foraging areas.

Each additional water development would directly benefit waterfowl and shorebirds by providing more stopover sites during migration and wintering or breeding sites at the larger developments.

Upland and small game would benefit from additional waters with surrounding exclosures because the relationship of protected area, disturbed area, and surrounding habitat would create edges or ecotones (Leopold, 1933), which could be beneficial in addition to the water source (Dick-Peddie, 1976; Thomas, Maser, and Rodiek, 1978).

Of the more than 300 nongame species in the EIS area, no more than 30 birds and mammals would benefit directly from additional livestock waters (Elder, 1953; Wright, 1959). Nongame habitat in the disturbed areas would be severely impacted due to a reduction of plant cover and increase in soil compaction similar to that described by Busack and Bury (1974).

Water developments would have varying effects on protected and sensitive species. The bald eagle, peregrine falcon, and Bell's vireo would not be affected by additional waters. Water developments in desert tortoise crucial habitat, however, would concentrate livestock and increase the likelihood of forage competition and deaths due to trampling.

Other protected or sensitive wildlife would not be significantly impacted by additional water developments, except for the Hualapai vole and the Sonoran mountain kingsnake. Each water in the 6,000 acres of vole and kingsnake habitat would permanently destroy at least 40 acres of their habitat.

Impacts of water developments on riparian habitat would vary, depending on the location of the waters. Waters within 2 miles of riparian habitat would not improve riparian quality, since such waters would not effectively draw livestock away from riparian corridors. Conversely, waters beyond 3 miles from riparian areas (using the distance from water suitability criterion, Appendix 1-1) would attract livestock into other foraging lands and result in a slight long-term slackening of cattle grazing in the riparian corridor. Data, however, are lacking on the extent of the problem and the amount of improvement attainable. Improved water distribution alone would not greatly improve the quality of riparian habitat in the EIS area.

Fences

Fencing would extend through 28 allotments for 266 miles, permanently disturbing 27 acres of habitat. Fencing would have only negligible impacts on all wildlife except big game.

A maximum of 13 miles of fence in crucial elk habitat (Map 2-3) would have adverse short-term and long-term impacts of unknown extent on elk by increasing mortality, impeding elk movement, and upsetting existing use patterns (Ferrell, 1980).

Although fences would be designed to reduce deer mortality, an unknown number of deer would die from entanglement while trying to cross fences. Fences would also disrupt use patterns until deer learn to cross them. This moderate adverse impact would continue into the long term.

Pronghorn antelope have a long history of conflicts with rangeland fencing (Rouse, 1954; Oakley, 1973), and Yoakum (1978) recommends against increases in fencing. The maximum 25 miles of fences would block pronghorn movement in their crucial habitat (Map 2-3) and would cause additional deaths, even though the fences would be constructed to safe specifications. The herds on Goodwin and Bozarth Mesas would be compartmentalized with unknown effects through the short and long term.

Bighorn sheep would be adversely impacted by 27 miles (maximum) of fencing in or near their crucial habitat (Map 2-3). Increased fencing would increase bighorn deaths and block needed freedom of movement.

Fencing under the proposed action would not significantly affect javelina or riparian habitat.

Fire

The proposed action would increase wildfire frequency over present conditions by increasing fuel by 8 percent. This increase was determined by comparing the change in allocation between the existing situation (initial allocation under no action) and the alternatives (Table 2-2). If a significant acreage is allowed to burn, wildfire in pinyon-juniper, grassland, chaparral, and desert shrub vegetation types would result in an increased production of forage and cover, especially forbs and browse. Wildfires also speed up beneficial habitat changes in chaparral and grassland vegetation types, improving their rangeland condition if the land is not overstocked afterward (Stoddart and Smith, 1955). Improved rangeland condition in these vegetation types would benefit mule deer, pronghorn antelope, Gilbert's skinks, Gila monsters, golden eagles, prairie falcons, merlin, and the zone-tailed, sharp-shinned, Cooper's, and ferruginous hawks (BLM, 1980a;b).

WILD BURROS

The proposed action would reduce the EIS area's burro population by 84 percent, from 843 to 139 burros (5,058 to 834 AUMs). Burro use would be eliminated on the Gibson and Groom Peak allotments and on the western third of Greenwood Peak Community allotment. Burro use would continue at a reduced level on 11 allotments: Arrastra Mountain, Artillery Range, Bagdad, Black Mesa, Burro Creek Ranch, Francis Creek, Greenwood Community, Alamo Crossing, Chino Spring, DOR, and the eastern two-thirds of Greenwood Peak Community.

The initial removal of 704 animals would cause some stress to the captured animals and might slightly stress the remaining population. Few burros are expected to die during removal. The burros would be removed through a live-capture program and adopted through BLM's "Adopt a Burro" program. The stress period for the captured animals would generally last only until the burros become accustomed to captivity.

At a 17 percent herd increase, a continuing removal program would have to remove 24 burros a year to maintain the population at an average of 139 burros. The remaining population would be exposed to short periods of stress during the annual removal.

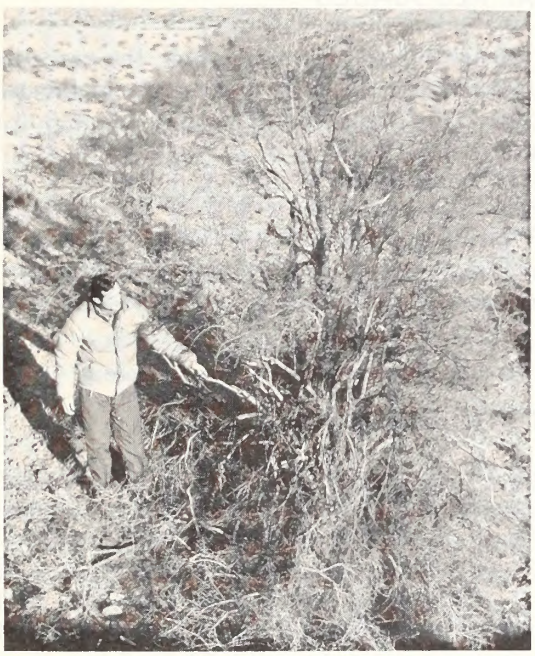
Eight of the 11 allotments where burros would continue to graze are designated for intensive management. Additional water developments would benefit burros by increasing their area of use during the hot dry months, if the waters are maintained in pastures being rested from livestock use. Pasture fences, however, would hamper movement to an unknown extent. This problem would be addressed on a case-by-case basis in AMPs and the herd management area plan.

Designation of the Alamo Crossing, Chino Springs, and DOR allotments as ephemeral would benefit burros by decreasing competition for water, cover, and feed during the hot dry periods.

LIVESTOCK GRAZING

Adjustments in Livestock Numbers

The proposed action would initially reduce livestock numbers on Federal and controlled lands (see Glossary) 38 percent from the present 5-year average licensed use and 53 percent from authorized grazing preference.



Uncontrolled Wild Burro Populations Can Damage Vegetation

Rapidly expanding wild burro populations compete with wildlife and livestock for food. When preferred forage plants are eaten up, the burros turn to less palatable trees and shrubs, eating the tender layers under the bark of the branches. Not only do burros eat the current year's growth, but they destroy years of production and kill or stunt plants. A paloverde tree pictured above has been severely impacted by burro use in the Chino Springs allotment.

Licensed use on small ranches in the EIS area would be reduced by an average 37 percent from the 5-year average licensed use and 53 percent from authorized grazing preference. Twenty years after implementation, increases in forage production would allow stocking levels on these ranches to increase to an average of 8 percent below the present 5-year average licensed use or 32 percent below authorized grazing preference.

Initial adjustments would reduce livestock numbers on medium-sized ranches by an average of 46 percent from the 5-year average licensed use and 52 percent from authorized grazing preference. Over a 20-year period, increased forage production would allow livestock numbers to increase, but only to an average of 24 percent below present average licensed use. After 20 years, however, Boriana "A" and Kent's Cane Springs "B" allotments would exceed their current grazing levels.

Large ranches in the EIS area would undergo an average initial reduction of 30 percent from the current 5-year average licensed use and 50 percent from authorized grazing preference. Initial allowable use on Francis Creek allotment, however, would increase over its authorized grazing preference, and initial allowable use on Chicken Springs and Artillery Range allotments would increase over their present 5-year average licensed use. Forage increases over a 20-year period would permit average stocking levels on larger ranches to increase to within 5 percent of present 5-year average licensed use.

Initial reductions in livestock numbers would force some operators to become more dependent upon non-Federal lands for livestock forage until forage increases. Such pressure could result in higher stocking levels on non-Federal lands, the purchase or lease of additional pastures, or the supplemental feeding of some livestock.

Table 3-8 groups allotments by ranch size. Appendices 2-2 and 2-3 show initial and projected allocations by allotment.

Ranching Operations

The proposed action would place all or portions of 28 allotments, involving 25 operators, under intensive grazing management. These allotments would generally shift from yearlong grazing to grazing systems with periodic rest and seasonal deferment. Intensive grazing management would require an increase in operator labor to monitor herds, maintain pasture fences, and move livestock from pasture to pasture. Proposed water developments would improve livestock distribution within allotments. Better distribution and stocking at proper levels would also reduce grazing pressure in overgrazed areas. Over time, key forage species production would increase and vigor would improve, increas-

ing the quality and the quantity of feed available for livestock grazing.

Implementing intensive management would require many rangeland developments whose construction would increase operator workloads and expenses. These additional costs would be a relatively short-term impact, but increased maintenance costs would amount to a long-term impact.

Four allotments involving two ranch operations would be less intensively managed, and 15 allotments involving 11 ranch operations would be nonintensively managed. Management of these operations would not change.

Ephemeral grazing would continue on Boriana "B" and DOR allotments, which would not be impacted by the proposed action. Alamo Crossing and Chino Springs allotments are also proposed for ephemeral grazing management. Although both are designated perennial-ephemeral, the overall impact would be slight, since they are run as a seasonal yearling operation within one ranch unit.

Livestock Performance

Intensively managed grazing would require livestock to change established grazing habits. Livestock would have to adapt to new terrain, water sources, increased concentrations, and more frequent handling and movement. Initially, the stress of this change might cause weight loss. As livestock adapt to the new systems, however, their performance would improve.

Lower initial stocking rates would generally allow more forage for each grazing animal than presently exists. Over time, the lower stocking rates, coupled with grazing systems, would improve rangeland conditions. The more desirable forage species for livestock would increase, increasing weight gains and calf crops and reducing death loss (see Table 4-10).

Fencing of pastures and allotment boundaries would permit greater control over livestock and help in detecting livestock trespass. Grazing systems would further benefit livestock production by requiring operators to handle, move, or work their livestock more regularly. Ranchers would be in a better position to care for their animals and to monitor animal health, quality, and breeding.

In the long term, ranching operations that successfully weather initial reductions should be more stable under the proposed action because of a sustained production of beef at an optimum level.

TABLE 4-10
IMPACTS ON LIVESTOCK PERFORMANCE BY RANCH SIZE

	Existing Situation	Proposed Action	No Action	Moderate Management	Wildlife Enhancement
Small Ranch (0-150 head)					
Calf Crop (percent)	55	63	55	61	63
Steer Calf Weaning Wt. (lbs.)	510	561	485	561	561
Heifer Calf Weaning Wt. (lbs.)	480	528	456	528	528
Cull Cow (percent)	20	17	20	18	17
Medium-Size Ranch (151-300 head)					
Calf Crop (percent)	62	71	62	68	71
Steer Calf Weaning Wt. (lbs.)	490	539	465	539	539
Heifer Calf Weaning Wt. (lbs.)	417	459	396	459	459
Cull Cow (percent)	17	14	17	15	14
Large Ranch (>300 head)					
Calf Crop (percent)	62	71	62	68	71
Steer Calf Weaning Wt. (lbs.)	516	568	490	568	568
Heifer Calf Weaning Wt. (lbs.)	437	481	415	481	481
Cull Cow (percent)	17	14	17	15	14

VISUAL RESOURCES

Through increases in vegetation, the proposed action could change the color and texture of the existing landscape. This change would be gradual and most evident along roads. Short-term and highly localized visual contrasts would result from rangeland developments. Contrast ratings will be completed for all rangeland developments to ensure that recommended visual resource management (VRM) class objectives are met. For criteria and methodology, see BLM Manual 8400.

CULTURAL RESOURCES

Since significant direct impacts on cultural resources will be avoided or mitigated, this analysis deals with inadvertent or indirect impacts only. The source and significance of impacts on cultural resources from present grazing management are shown in Table 4-11. Under the existing situation most agents of site deterioration are tied to rangeland developments.

Rangeland developments may affect cultural resources in the following ways: (1) loss of the spatial relationships between cultural materials and their surroundings; (2) loss of entire site elements, such as artifacts, features, or portions of site areas; (3) loss of historical context, especially information on occupation dates and prehistoric environment; and (4) reduction in the cultural resource base after salvage operations. The nature and degree of these impacts from grazing management have not been adequately monitored and documented. A limited study by Roney (1977), however, indicates that cattle trampling significantly damages lithic sites and artifacts.

TABLE 4-11
EXISTING AND FUTURE IMPACTS ON CULTURAL RESOURCES*

Component	Agent of Deterioration	Existing** Situation	Proposed Action	No Action	Moderate Management	Wildlife Enhancement	Eliminate Livestock
Rangeland Developments	Construction - undiscovered CR	Moderate	>>>	>	>	>>	<<
	Concentrated Trampling	Moderate	>>	>>>	<<<	<<	<<<
	Vandalism - from increased access	High	>>>	>	>	>>	<
	Site Erosion	Low	>>	>>	<<	<	<<<
Stocking Levels	Livestock Grazing	Low	<	>>	<<	<<<	<<<
Grazing System	None	—	—	—	—	—	—

* Impacts compared to existing situation.
> = low increase
>> = moderate increase
>>> = high increase
< = low decrease
<< = moderate decrease
<<< = high decrease
— = no change

** All impacts under the existing situation are considered adverse and long-term, since cultural resources are nonrenewable and lost information is irretrievable.

The significance of these impacts on cultural resources varies according to the location and condition of the site. Buried deposits, undetectable by intensive surface survey (Class III), could be affected by construction. Concentrated trampling of livestock would have the greatest effect on surface sites, which include most of the sites in the EIS area. This source of deterioration is especially significant for habitation and camp sites near water sources, but most rockshelters, rock art, and rock alignments would hardly be affected. All site types are vulnerable to vandalism and looting, but structures, rockshelters, and rock art are more common targets. The degree and extent of this impact depends on the accessibility and use of an area. Although site erosion occurs on most sites, surface artifact scatters, especially those in unstable soils, probably would suffer more than other site types. Livestock grazing directly affects certain cultural resources. For example, surface features and structures can be destroyed by trampling and rubbing.

The impacts of grazing management on cultural resources vary by allotment, since allotments contain different amounts of sensitive areas. The acreage of sensitive areas per allotment was calculated and an index of sensitivity (i.e. percent of sensitive area per allotment) was computed as shown in Appendix 3-4. Allotments were then ranked by the total acres of sensitive areas (raw rank) and by the sensitivity index (adjusted rank). Table 4-12 shows the resulting sensitivity ratings by allotment.

The impacts of grazing management on cultural resources are summarized in Table 4-11. The proposed action and alternatives are compared to the existing situation and are rated as high, moderate, or low increases or decreases. Because cultural resources are nonrenewable and the loss of information resulting from these impacts is irreversible, all impacts are considered adverse and long term.

In general, the proposed action would result in a high increase in impacts to cultural resources in the EIS area (Table 4-11). The proposed action calls for almost twice as many miles of fence and pipeline and 40 percent more rangeland developments than would be built under continuation of present management. The potential is high for the destruction of undiscovered sites during construction. Vandalism would also increase due to more use of and access to rangeland facilities. Since the proposed stocking levels are lower than present levels, the impacts from livestock grazing would be reduced.

TABLE 4-12
CULTURAL RESOURCE SENSITIVITY RATING BY ALLOTMENT

Allotment		Adjusted Sensitivity Rating* High	Moderate	Low	Raw Sensitivity Rating** High	Moderate	Low
Alamo Crossing		X	--	--	X	--	--
Arrastra Mountain		--	X	--	--	X	--
Artillery Range		--	--	X	--	X	--
Bagdad		--	X	--	X	--	--
Bateman Springs		--	--	--	--	--	--
Big Sandy		--	--	X	--	X	--
Black Mesa		--	X	--	--	--	X
Boriana	'A'	X	--	--	X	--	--
	'B'	--	--	--	--	--	--
Bottleneck Wash		--	--	X	--	--	X
Burro Creek		X	--	--	--	X	--
Burro Creek Ranch		--	X	--	X	--	--
Byner		X	--	--	X	--	--
Cane Springs Wash	'A'	--	X	--	--	--	X
	'B'	X	--	--	--	--	X
Chicken Springs		--	--	X	--	--	X
Chino Springs		--	X	--	--	X	--
Diamond Joe		--	--	X	--	--	X
DOR		X	--	--	--	--	X
Fancher Mountain		--	X	--	--	X	--
Francis Creek		--	--	X	X	--	--
Gibson		X	--	--	X	--	--
Gray Wash		--	X	--	--	X	--
Greenwood Community		--	X	--	--	X	--
Greenwood Pk. Community		X	--	--	X	--	--
Groom Peak		--	--	X	--	--	X
Happy Jack Wash		--	--	X	--	--	X
Hot Springs		X	--	--	--	--	X
Hualapai Peak		--	--	X	--	--	X
JJJ		X	--	--	--	--	X
Kayser Wash		--	--	X	--	--	X
Kellis		--	X	--	--	--	X
Kent's Cane Spring	'A'	X	--	--	X	--	--
	'B'	X	--	--	X	--	--
La Cienega		--	--	X	--	X	--
Lazy Yu	'A'	--	X	--	--	X	--
	'B'	--	--	--	--	--	--
Lines		--	--	X	--	--	X
Little Cane		--	--	X	--	--	X
Los Molinos		--	--	--	--	--	--
McElhaney		--	X	--	--	X	--
Round Valley		--	--	--	--	--	--
Sandy	'A'	--	--	X	--	--	X
	'B'	X	--	--	--	X	--
Sweetmilk		--	X	--	X	--	--
Trout Creek		X	--	--	--	--	X
Walnut Creek		--	X	--	X	--	--
White Spring		X	--	--	--	--	X
Wikieup		--	X	--	--	--	X
Yellow Pine	'A'	X	--	--	X	--	--
	'B'	--	--	X	--	--	X

* Adjusted Sensitive Rating:
High = Rank of 1-14
Moderate = Rank of 15-28
Low = Rank of 29-42

** Raw Sensitive Rating:
High = Rank of 1-12
Moderate = Rank of 13-24
Low = Rank of 25-36

RECREATION

The proposed action would have measurable impacts on hunting and negligible impacts on ORV use and sightseeing. Big-game populations within the EIS area are expected to increase by 3,070 animals, increasing by 21,258 the estimated annual big-game hunting visitor days. The increase in visitor days due to increases in small and upland game cannot be estimated with accuracy. Increases in game would also slightly increase opportunities for viewing wildlife. On the other hand, the 266 miles of proposed fencing would slightly decrease ORV cross-country opportunities. See Table 4-13.

WILDERNESS VALUES

On lands in the EIS area proposed as wilderness study areas all rangeland management activities will comply with BLM's *Interim Management Policy and Guidelines for Lands under Wilderness Review* (BLM, 1979b). No adverse impacts on wilderness values are expected.

ECONOMIC AND SOCIAL CONDITIONS

Economic Conditions

This section describes the economic impacts to the EIS area ranchers and the community from the propos-

TABLE 4-13
PROJECTED BIG-GAME HUNTING VISITOR DAYS[1]

	Present Situation	Proposed Action	No Action	Moderate Management	Wildlife Enhancement	Eliminate Livestock
Big Game Hunting	30,600	52,128 (+70%)	25,882 (-15%)	48,712 (+59%)	54,927 (+79%)	48,712 (+59%)

[1] Projected for 20 years after implementation of an alternative. These estimates will vary for several reasons not related to the rangeland management: gasoline availability, demand, regional population increases, Arizona Game and Fish Department regulations, climatic conditions, increased costs, and legal access to public lands.

Source: Wildlife Table 4-9; BLM, 1980a;b.

ed action, including impacts from the expected changes in construction income and recreational use. Impacts to individual ranch operations cannot be quantified due to a lack of financial data for individual ranches. Rather, impacts to these operators are analyzed through the use of three representative ranch budgets. Information from these ranch budgets is then used to determine the economic impacts to the economy of Mohave County.

Generally, impacts to individual ranchers are expected to be similar under the proposed action, moderate management, and wildlife enhancement. To avoid duplication, these impacts are discussed only under the proposed action. Changes in the representative ranch budgets, and changes in the ranch employment and earnings are detailed in Appendices 4-2, 4-3 and 4-4.

Ranch Budgets

Small Ranch. Under the proposed action the herd size of the typical small ranch would temporarily be reduced 37 percent from 67 to 42 head. Long-term forage improvements, however, would allow this typical ranch eventually to stock at 56 head, a 33 percent increase over the short-term reduction

Yearly net revenue (gross revenue minus cash costs) in the short term would fall from $2,215 to $1,159. Long-term increases in herd size combined with improved calf crops and calf weights would increase yearly net revenue to $3,186 after 20 years.

To determine whether over a 30-year period the typical small rancher would be financially better off under continuation of present grazing or the proposed action, BLM economists calculated the present values of the expected yearly net revenues for each alternative. The present value of 30-year net revenues under present management amounts to $23,582, whereas the present value of the proposed action amounts to $26,562 (Table 4-14). Therefore, ranchers in the small ranch class would be financially better off under the proposed action than under present management.

The herd reduction might force some small ranchers to sell their operations, but most have outside employment and would probably reduce their herd size and continue their operation.

Medium-Size Ranch. The typical medium-size ranch has 212 cows and would undergo a short-term reduction of 46 percent to 114 head. Long-term increases in forage production, however, would allow the herd size to increase to 158 head, a 39 percent increase over the short-term reduction.

Short-term net revenue would decrease from $10,567 to $4,777, but over a 20-year period, net revenue would gradually increase to $11,405, assuming an increase in calf crops and calf weights (see Table 4-15).

TABLE 4-14
TOTAL NET RANCH REVENUE OVER A 30-YEAR PERIOD*

Ranch Size	Proposed Action	No** Action	Moderate Management	Wildlife Enhancement	Eliminate Livestock
Small (0-150)	26,562	23,582	18,723	18,055	1,078
Medium (151-300)	98,352	115,647	72,358	74,860	20,862
Large (301-Over)	261,097	250,050	175,470	189,423	30,463

* Present value in 1979 dollars.
** Net values under the no-action alternative are used as a base for comparing the various alternatives.

The present value of 30-year net revenues on the medium-size ranch under present grazing management amounts to $115, 647, whereas such revenues under the proposed action amount to $98,352. Thus, ranchers in the medium-size class would be financially better off under present management than under the proposed action.

TABLE 4-15
RANCH ECONOMIC IMPACTS BY ALTERNATIVE

Impacts	Proposed Action		No Action		Moderate Management		Wildlife Enhancement		Eliminate Livestock	
	Short Term	Long Term	Short Term	Long Term	Short Term	Long Term	Short Term	Long Term	Short Term	Long Term
Net Revenue ($)										
Small-(0-150 head)	1,159	3,186	2,215	1,707	977	2,101	683	2,295	88	88
Medium (151-300 head)	4,777	11,405	10,567	8,592	4,146	7,735	3,369	8,958	1,703	1,703
Large (>300 head)	8,985	34,115	18,435	13,692	6,984	21,945	5,460	25,849	2,486	2,486
Ranch Values ($)										
Small (0-150 head)	69,000	133,920	131,625	131,625	57,000	75,600	46,500	77,400	22,500	22,500
Medium (151-300 head)	187,500	313,200	412,500	412,500	154,500	228,600	136,500	232,200	75,000	75,000
Large (>300 head)	844,500	1,359,000	1,394,750	1,394,750	696,000	986,400	613,500	995,400	475,500	475,500

The proposed action might force ranchers in the medium-size class to supplement ranch income with an outside income source. Family labor requirements would be reduced from 4,895 to 2,640 hours per year or from 1.9 to 1 workyears. Gradually over a 20-year period, labor requirements would increase to 3,646 hours or 1.4 workyears. Ranch labor requirements would probably not allow ranchers in the medium-size class to operate the ranch and have outside employment income. Thus, the rancher might be forced to sell the ranch property and find other employment or reduce the ranch herd size to a level that would allow time for an outside job.

Large Ranch. The typical large ranch has 788 cows and would undergo a reduction of 35 percent to a herd size of 512 cows. Long-term increases, however, would allow the herd size to increase to 686 cows—a 34 percent increase over the short-term reduction.

Net revenue would temporarily decrease from $18,435 to $8,985, but over a 20-year period would gradually increase to $34,115, assuming that calf crops and calf weights increase (see Table 4-15).

The present value of the 30-year net revenues of the typical large ranch under present management amounts to $250,050, whereas such revenues under the proposed action amount to $261,097. Thus, large operations would be financially better off under the proposed action than under present management.

The impact of the proposed action on the EIS area's large ranches would depend on the individual ranch's cost structure. Ranchers financially able to undergo a short-term reduction in net revenue might stay in business long enough to take advantage of the expected long-term net revenue increases. Those unable to withstand a short-term reduction in net revenue might be unable to remain in business.

Ranch Finance

A rancher's ability to borrow money for operating and long-term expenses is primarily determined by the rancher's current assets and liabilities and by the ranch's profitability.

Ranch market values add greatly to the rancher's assets. Although BLM does not recognize the right to treat grazing permits as real property, they are bought and sold with the base property. They are also used as collateral for loans. Ranch values are based on the ranch's current allowable use, even though this use may be higher than the ranch's 5-year average license use.

The following estimated reductions in ranch values are based on current allowable use figures at an estimated value of $125 per AUM (Flake, 1980). Long-term increases in ranch productivity under the proposed action are expected to increase the value of an AUM to $150. Ranch values on the typical small ranch would initially decrease from $131,625 to $69,000. Long-term AUM increases, however, would raise the value of the small ranch to $133,920. On the typical medium-size ranch, values would decrease from $412,500 to $187,500 but increase to $313,200 in the long term. On the typical large ranch, values would decrease from $1,394,750 to $844,500 but increase to $1,359,000 in the long term.

Ranch profitability for all typical ranch sizes, measured in net revenue, would also decline in the short term. This decline combined with the decrease in ranch values would probably make bankers reluctant to loan operating capital and long-term capital to area ranchers. Long-term AUM increases, however, would increase ranch values and ranch profitability. These increases would improve the financial condition of the ranches, making it easier for ranches to attract operating capital.

How the proposed action would affect the rancher's ability to pay existing loans is not known but would depend on the AUM reduction on a specific ranch and the indebtedness of that ranch.

Regional Economics

Under the proposed action, total gross receipts from the sale of livestock for the 30 EIS area ranchers would decrease from $1,279,540 to $802,660 in the short term. This decrease would reduce the ranchers' con-

TABLE 4-16
REGIONAL ECONOMIC IMPACTS BY ALTERNATIVE

Regional Impacts	Proposed Action		No Action		Moderate Management		Wildlife Enhancement		Eliminate Livestock	
	Short Term	Long Term	Short Term*	Long Term	Short Term	Long Term	Short Term	Long Term	Short Term	Long Term
Ranch Receipts ($)	802,660	1,326,710	1,279,540	1,163,590	727,940	1,010,810	637,980	1,069,490	459,790	459,790
Ranch Expenditures ($)	653,450	839,650	967,370	923,680	606,870	693,000	542,860	698,470	417,020	417,020
Ranch Net Revenue ($)	149,210	487,060	312,170	239,910	121,070	317,810	95,120	371,020	42,770	42,770
Ranch Employment (Workyears)	27.10	42.40	47.77	42.64	24.96	32.38	19.32	33.87	11.60	11.60
Ranch Employment Related Earnings[1] ($)	260,702	407,888	459,637	410,200	240,115	311,496	185,858	325,829	111,590	111,590
Construction Earnings [2]($)	+ 318,450	NA	+ 142,730	NA	+ 142,730	NA	+ 284,120	NA	+ 675,000	NA
Recreation-Related Earnings [3] ($)	**	+ 92,736	**	- 20,328	**	+ 78,021	**	+ 104,793	**	+ 78,021

[1] Ranch earnings represent the total value of paid family labor and the value of paid hired labor.
[2] Construction earnings represent the average yearly expenditures for range improvements and will extend over a 5-year period.
[3] Recreation related earnings represent the income earned by the additional employees needed to service the expected increased recreational activity in the planning area. The amount shown represents the yearly income in the 20th year.
* The short term under the no-action alternative represents the existing situation for this analysis.
** Short term recreation-related earnings have not been projected.
NA = Not applicable.

tribution to Mohave County's yearly livestock sales from 5.1 to 3.2 percent. Gradual increases in AUMs would increase livestock sales to $1,326,710 or 5 percent of the county total (Table 4-16).

Ranch operating expenses for the 30 ranchers would decrease from $967,370 to $653,450 in the short term but increase to $839,650 after 20 years. Net revenue would decrease from $312,170 to $149,210 in the short term but increase to $487,060 after 20 years.

Ranch labor requirements would decrease from 47.77 to 27.10 workyears and increase after 20 years to 42.40 workyears. Earnings from this ranch employment would decrease by $198,935 or 0.8 percent of the total agricultural income in Mohave County. Long-run increases in AUMs of forage would increase employment earnings to $407,888 or 1.6 percent of the county's total agricultural earnings.

Construction Income

Estimated construction earnings from new rangeland developments would amount to $318,450 per year for 5 years. This income would contribute an additional 2.2 percent per year to the county's 1977 total construction earnings of $14,178,000 (BLM, 1979d).

Recreation Earnings

Annual visitor use for big-game hunting in the planning area would increase by 21,528 visitor days after 20 years, increasing recreation-related expenditures by $430,560. These expenditures would support 11.04 employees, assuming each employee sells $39,000 per year in recreation-related goods (BLM, 1979d). Recreation-related employment would add $92,736 of direct income to the county's economy.

Benefit-Cost Analysis

A benefit-cost analysis was conducted for 29 of the 45 grazing allotments in the EIS area for the proposed action, moderate grazing management, and the wildlife enhancement alternatives. (Allotments with A and B units were treated as single allotments for this analysis). Of the 16 allotments not analyzed, 4 are proposed for ephemeral grazing, and 12 are not proposed for rangeland developments.

The benefits and costs were estimated on an allotment-by-allotment basis. Benefits included livestock forage and production increases and wildlife-related recreation benefits. Benefits resulting from improved wildlife habitat and improved watershed cannot be quantified and were not considered in the analysis. The costs included the initial development costs and replacement and maintenance costs over a 50-year period. The complete benefit-cost analysis is available for review in the Hualapai-Aquarius Management Framework Plan (BLM, 1980d).

The overall benefit-cost ratio for rangeland developments under the proposed action amounts to 0.97:1. This ratio, however, is useful ony for comparing the total benefits and costs involved in each alternative. On an allotment-by-allotment basis, developments proposed for 3 allotments were found to have benefit-cost ratios greater than 2:1; developments proposed for 9 al-

lotments were found to have benefit-cost ratios between 1:1 and 2:1; and developments proposed for 17 allotments were found to have benefit-cost ratios below 1:1.

Social Attitudes and Values

For several reasons, social perceptions and attitudes of Mohave County residents are not expected to be measurably impacted as a result of a decision to implement any of the alternatives.

The first reason pertains to the attitudes residents have toward BLM. Only 15 percent of the respondents in the market research survey credit BLM with placing enough value on public opinion. Although 37 percent of the respondents think the response of BLM to public concerns is acceptable, only 11 percent feel this has been either good or very good. The data indicate that the public is skeptical about BLM's sensitivity to local public interests. In Mohave County the public is concerned about ranching, but according to the survey data, BLM "doesn't seem to care about this."

A second reason for a lack of significant impacts on social attitudes and perceptions is implicit in the data concerned with the residents' estimate of the kind of job BLM has done. Although most respondents claimed to be familiar with BLM, only 45 percent of these felt BLM had "done a good job" in the past 12 months.

The prevalence of a conservative attitude in Mohave County toward the activities and influence of the Federal government is the essence of the third reason. Residents feel the Federal government has had too much influence and that it might have even more in the future. They want less. They also want more to say about the decisions that are made. But they recognize that this is not likely to be the case.

Mohave County residents have little confidence in, or respect for BLM. They will accept BLM's decisions but not approve of them. They will have this attitude toward any decision to implement the alternatives discussed in this document.

SUMMARY

If implemented, the proposed action would meet all of nine planning objectives identified in Chapter 1. Objectives to improve riparian habitat would only be partially met. Impacts to cultural resources might be high because of construction impacts from the many proposed rangeland developments. Reductions in livestock and wild burros and rest from grazing in riparian habitat would offset some of the impacts occurring to these resources. Other resources, including watershed, wildlife, vegetation, recreation, and protected plants and animals would generally benefit from the proposed action.

IMPACTS OF CONTINUATION OF PRESENT GRAZING MANAGEMENT

VEGETATION

Usable Forage Production

Continuous grazing and heavy utilization under the continuation of present grazing would result in the more desirable forage plants being replaced by undesirable forage plants (Hormay, 1970; Jenkins, 1972; Humphrey, 1962). Average usable forage production would decrease from 116 to 104 pounds per acre. The largest decrease would occur in the grassland vegetation type (157 to 106 pounds per acre), and the smallest decrease would occur in the creosotebush vegetation type (72 to 69 pounds per acre) as shown on Table 4-1.

Construction of rangeland developments would temporarily disturb 204 acres of vegetation, but only 111 acres would be lost in the long term from heavy grazing around new waters and from the construction of developments.

Plant Cover

Continued heavy utilization and lack of minimum rest periods would result in a loss of palatable plants followed by a loss of plant cover (Holechek, 1980). Plant cover would decrease from 22 to 19 percent, the greatest change occurring in the grassland vegetation type (18 to 12 percent) and the smallest change in the chaparral (44 to 41 percent) and desert shrub (26 to 24 percent) vegetation types (Table 4-2). A decrease in cover indicates a decline in vegetation and plant succession (Heady, 1967).

Rangeland Condition

Maintaining the same stocking rates presently used would degrade vegetation in the EIS area, since past and present stocking rates have placed 65 percent of the rangeland in poor or fair condition. Rangeland condition reflects the past and current stocking rates of the main grazing animals inhabiting an area (Petrides, 1975).

Forage used by livestock, big game, and wild burros exceeds the available forage determined by the rangeland inventory, and continuing present use would deteriorate rangeland condition. The problem would be especially acute on allotments with high burro populations.

Rangeland condition would decline on most allotments because of the continued heavy utilization

and lack of minimum rest. Continuous grazing during the critical growth periods would degrade plant vigor and decrease reproduction and litter accumulation.

Overgrazing of habitat may lead to deterioration of rangeland condition and even to rangeland destruction (Petrides, 1975). Overall rangeland condition would decline as follows: excellent from 20,724 to 11,194 acres; good from 280,791 to 135,907 acres; fair from 466,231 to 296,050 acres; and poor from 89,003 to 413,598 acres. Projected rangeland condition by vegetation type is shown in Table 4-3 and by allotment in Appendix 4-1.

Key species composition would change as rangeland condition deteriorates. As acres decline from excellent to good condition, key species composition would decrease from 30 to 22 percent. As rangeland condition declines from good to fair, key species composition would decrease from 22 to 15 percent. And as rangeland condition declines from fair to poor, key species composition would decrease from 15 to 8 percent (Table 4-4).

On rangeland in poor condition perennial grasses would grow only beneath the crowns of shrubs or at exceptionally favorable or inaccessible sites. Woody plants would form the dominant aspect (Martin, 1975b).

Riparian Vegetation

Continuation of present management would result in a decline in the condition of riparian vegetation. None of 37 acres in good condition would remain so, and fair condition rangeland would drop from 1,862 to 37 acres. Rangeland in poor condition would increase from 2,905 to 4,767 acres.

Woody riparian species (presently limited in abundance) are highly susceptible to continued heavy grazing. Food reserves and areas of growth initiation are often located in twigs and stems, which are exposed to grazing. Heavy grazing on these stems after food reserves are stored during the dormant period would reduce vigor and production.

Livestock overgrazing probably contributes most to the failure of riparian communities to propagate. Continued overuse of riparian areas would eliminate most new plant production (Davis, 1977).

Usable forage production would decrease from 165 to 153 pounds per acre, and key species composition would decrease as condition classes decline. Plant cover would decrease from 26 to 24 percent.

Protected Plants

Grazing animals are expected to continue trampling and eating protected plants, decreasing plant vigor, reproduction, and cover. The extent of damage, however, cannot be predicted.

SOILS

Erosion

Overall, continuation of present grazing management would adversely affect the EIS area's soils. Yearlong grazing and overstocking would decrease total ground cover, increase soil compaction, and decrease water infiltration and retention. In addition, soil erosion would be expected to increase. The 9,384 acres in critical-severe erosion condition and the 97,523 acres in moderate erosion condition would be expected to further deteriorate during the next 20 years. These projections are based on erosion studies conducted by the Science and Education Administration, USDA, at the Walnut Gulch Experiment Station in southeastern Arizona (Arizona Inter-Agency Range Committee, 1972). In riparian areas, soils now in moderate to critical erosion condition would continue to deteriorate. Finer textured soils, such as the Springerville, Cabezon, and Thunderbird (soil association 12—Grassland soils) would be impacted the most. (See Table 4-5, Impacts on Soils.)

Construction of new rangeland developments under continuation of present grazing management would temporarily disturb 204 acres of soil and permanently occupy 111 acres. The plants and soils disturbed would need an estimated 3- to 10- year period to recover (BLM, 1978b). The major impact to the soil would be the 111 acres permanently lost to rangeland developments, but this acreage is insignificant compared to the total EIS area.

During the construction and recovery period, soil compaction and the removal of ground cover would increase soil erosion. But as vegetation and litter increase, soil erosion would decline. The short-term and long-term impacts—increased soil erosion and decreased ground cover—would be insignificant when compared to the total soil erosion in the EIS area. See Table 4-6, Soil Impacts—Rangeland Developments.

Sediment Yield

Over a 20-year period, decreasing ground cover and increasing upland erosion would increase the EIS area's sediment yield by 0.03 acre-feet/square mile/year. Table 4-7 shows expected increase in sediment yield by soil association.

WATER RESOURCES

Water Quantity

The increased storage capacities of new water developments would decrease surface water by 26.6

acre-feet. Increased runoff from continued heavy grazing, however, might increase surface water supplies on the small watershed scale. Water consumption would increase by 38 acre-feet to 77 acre-feet for livestock, burros, and big game.

Increased runoff would result from decreased infiltration associated with increased bare ground (Branson, Gifford, and Owen, 1972; Leithead, 1959). The amount of soil moisture stored would decrease as less water infiltrates. But soil moisture would be held longer (Cable, 1980), reducing infiltration and increasing the frequency and size of floods.

Ground water supplies would be reduced locally by the development of nine new wells at an estimated combined storage capacity of 0.5 acre-feet.

Water Quality

No decreases in fecal coliform or nutrient pollution are expected. Reduced ground cover and increased surface disturbance and runoff would increase sediment to an unknown extent. The increase in sediment would degrade water quality to an unknown degree.

Continued present management would not affect ground water quality as long as wells are properly located and designed.

WILDLIFE

This section evaluates the probable impacts of continuing present grazing management on vegetation to reveal the extent and degree of grazing impacts on wildlife. The analysis assumes that apparent trends in rangeland condition, habitat condition, wildlife populations, and stocking levels would continue at existing rates. Table 4-17 rates impacts of continuation of present management on wildlife and its habitat.

Grazing Adjustments

The number of grazing animals would not be adjusted under this alternative. Wild burro numbers would be maintained at 1981 levels, leading to extreme overuse in allotments with burro herd units (Map 3-1). All available forage in burro use areas in the Bagdad, Greenwood Peak, Black Mesa, and Burro Creek Ranch allotments would be needed by wild burros, leaving livestock and wildlife users no available forage at proper use levels. Authorized grazing preferences, however, would still permit livestock to graze at levels 117 percent above estimated carrying capacity.

Big Game

The production in elk habitat would decline by 5 percent on the Hualapai Peak and Yellow Pine allotments. This decline would involve mostly perennial grasses, forbs, and browse used by elk and cattle. Over 1,300 acres would continue a downward trend in rangeland condition. The elk population would decline as cattle continue to compete with elk for the limited remaining forage (Table 4-9). In the long term, elk might be eliminated from the EIS area.

The productivity of mule deer habitat would decline by 10 percent. Allotments most affected would be Sweetmilk, Bagdad, Black Mesa, Burro Creek Ranch, Greenwood Peak, and Groom Peak, where cattle, mule deer, and wild burros would most heavily compete for forage and space. Rangeland condition would continue a downward trend on over 107,000 acres. Over the EIS area the decreased forage available to mule deer would decrease the deer population of public lands by at least 530.

Pronghorn antelope habitat would decline in production of forage plants by about 12 percent, primarily due to overuse of the rangeland caused by the overstocking of ungulates on the grassland vegetation type. Plant cover would also decrease by 33 percent (Table 4-2). Over 8,000 acres would decline in rangeland condition.

Habitat deterioration and increased forage competition would decrease the pronghorn population on public lands by 16 (20 percent).

Desert bighorn sheep habitat would decline in forage productivity by 9 percent. Over 16,000 acres would continue a downward trend in rangeland condition, nearly eliminating foothills as viable bighorn habitat. The decline in bighorn forage would reduce bighorn numbers by 11 percent.

Javelina would continue to increase on public land, but very slowly over the long term. Intense competition by all forage users on a diminishing resource base would limit the increase (Table 4-9).

Other Wildlife

On the basis of expected reductions in plant cover in favored habitat (Table 4-2) and continued disturbance by livestock, waterfowl and shorebird habitat would deteriorate by about 8 percent.

The perennial forage productivity of upland and small-game habitat would decline by 10 percent in the long term, forcing a greater reliance on ephemerals.

TABLE 4-17
WILDLIFE AND HABITAT IMPACT RATINGS UNDER CONTINUATION OF PRESENT MANAGEMENT[1]

Alternative's Features	Big Game					Special Status Species		Upland and Small Game	Nongame Wildlife	Riparian Habitats
	Mule Deer	Elk	Bighorn Sheep	Pronghorn Antelope	Javelina	Federal-Listed Threatened/ Endangered Species	Other Protected Species[2]			
Grazing Use										
Vegetation Production Available Initially	2	2	3	2	3	2	2	3	2	1
Vegetation Production Available in 5 years	2	2	2	2	3	2	2	3	2	1
Vegetation Production Available in 20 years	1	1	2	1	2	1	1	2	1	1
Levels of Grazing Management										
Yearlong	2	2	2	2	3	3	2	3	3	1
Nonintensive	2	2	2	2	3	3	2	3	3	1
Ephemeral	3	NA	3	NA	3	3	3	3	3	2
Management Facilities										
Water Developments	2	3	2	3	3	3	2	2	2	1
Fencing	2	3	2	2	3	3	3	3	3	3
Totals (Average)	2.0	2.1	2.3	2.0	2.9	2.5	2.1	2.8	2.3	1.4
	Average Rating for Alternative 2.2					Average Rating for Existing Situation 2.5				

[1] The rating system is as follows: 1 = most significant downward trend; 2 = downward trend; 3 = relatively static; 4 = upward trend, 5 = most significant upward trend; NA = not applicable.

[2] Proposed threatened or endangered species, State-listed species, BLM sensitive species.

Gambel's quail populations would fluctuate more than at present due to reduced forage (Gallizioli, 1960). Band-tailed pigeon and mourning dove populations would probably not noticeably decrease. Over the long term, white-winged dove populations would decrease with the continued 8 percent deterioration of habitat cover. Desert cottontail and jackrabbit populations would probably not significantly change due to continued rangeland deterioration.

Nongame habitat would change most noticeably under continued present management. The 10 percent decrease in forage production, 14 percent decrease in plant cover, and increased use of the remaining forage productivity would primarily affect the lower layers of vegetation most needed by nongame wildlife. About 709,000 acres of habitat would lack sufficient cover, representing a 28 percent increase in deteriorated habitat condition. Buttery and Shields (1975) and Wiens and Dyer (1975) discussed these relationships between rangeland condition and nongame birds. The quality of nongame habitat in riparian areas would greatly decline, and riparian habitat would remain far below its potential in the EIS area.

Protected and Sensitive Species

Protected and sensitive wildlife habitat would continue to degrade with declining cover and food components of the habitat. Aquatic and riparian bald eagle habitat would decline in productivity by at least 7 percent (Table 4-1). Roost trees would be fewer, and prey populations would decline in the long term. Use of the upper Bill Williams drainage would diminish to the point that bald eagles might stop wintering in the EIS area. In the long term, potential peregrine falcon habitat would be far less likely ever to support breeding pairs.

Forage productivity would decline by 11 percent for the desert tortoise habitat, bringing greater pressure from all herbivores on the winter-spring annuals. Desert tortoise populations would suffer greatly. In all but the wettest years, desert tortoises might not reproduce. In the long term, the tortoise populations would drop below their maintenance level of 50 individuals per square mile (Berry and Nicholson, 1979), below which their population cannot recover.

Bell's vireos nest in riparian habitats that are in good condition. The few sites in the EIS area where Bell's vireos breed would probably remain usable in the short term. In the long term, the vireo would be found only on 37 acres of Pine Creek and parts of Francis Creek.

Black hawk populations would remain unchanged in the short term. In the long term, they would begin a sharp decrease as nest trees die out, resulting in a lack of suitable nesting habitat. By the end of the 20-year period, few if any, black hawks would remain.

Zone-tailed hawks would be less affected than black hawks because of their wider distribution. In the long term, however, their numbers would decrease as suitable nesting trees become rarer.

Great egrets, snowy egrets, and black-crowned night herons would continue to use stock tanks, denuded areas around Alamo Lake, and sections of Burro Creek and the Big Sandy River as stopovers during migration. They would not, however, breed in the EIS area.

Gilbert's skink populations would be reduced in the long term because of reduction in plant cover. The lizard would be restricted to the chaparral only, a 47 percent decrease from the present habitat area of 155,000 acres.

The Gila monster's habitat would decline primarily due to declines in prey resulting from a plant cover loss of 12 percent.

The Sonoran mountain kingsnake would decrease in proportion to its prey base. The prey base would be reduced due to a 13 percent loss of cover in kingsnake habitat.

The continuation of present management would cause a loss of food and cover plants, nearly bringing the Hualapai vole to extinction. In the short term the species would probably be nominated for State and Federal listing as endangered. In the long term, if BLM does not change its management and the vole does not become extinct, it would be federally listed, critical habitat would be delineated, and a recovery plan would be developed.

The ferruginous hawk would continue to winter in the EIS area but would not breed.

Riparian Habitat

Riparian habitat would continue to degrade so that only 37 acres would be in better than poor condition in the long term. Dependent wildlife species previously discussed would no longer inhabit the EIS area or would be greatly reduced, seriously impacting the integrity of this biologically rich area.

Management

Management treatments would not change from the present and would not significantly affect wildlife in the EIS area.

Rangeland Developments

Waters

At most, 85 waters would be developed during the short and long term. Of these, 78 would provide year-round water. Additional waters would not benefit wildlife that are declining due to other limiting factors (cover, food, and space) in the habitat. The additional waters would accelerate habitat deterioration by permitting heavy livestock use of areas that previously have been lightly grazed, leading to increasing overuse of forage plants on the rangelands.

Fences

New fencing, installed in the short and long term, would extend for no more than 129 miles. Fencing would block big-game movement and increase big-game deaths, slightly speeding up the decrease of wildlife population in the long term.

Fire

Continuation of present management would decrease wildfire frequency by decreasing fuel produced by 3 percent. Fewer fires woulds result in fewer short-term and long-term site-specific improvements to wildlife habitat.

WILD BURROS

The no-action alternative would allocate no forage for wild burros in the EIS area, although burro numbers would be maintained at the January 1981 level. An estimated 843 burros would inhabit the burro-use areas, consuming 5,058 AUMs of unallocated forage and adversely impacting most burro-use areas.

In the burro-use areas along Burro Creek and the Big Sandy River, the public lands can produce 3,594 AUMs in their present condition. Yet the estimated 595 burros in these areas require 3,570 AUMs (99 percent of the available forage) to maintain a viable, healthy herd. All 3,594 AUMs are not allocated to domestic livestock, and grazing animals consume twice the AUMs available for proper grazing. Grazing animals would soon consume all grazable plants, and livestock and wild burro herds would soon decline. Over time, burro capture programs would not be necessary in this area because of a dramatic loss in productivity and declining burro populations.

The other burro-use areas are not at the same critical level as Burro Creek and the Big Sandy River, and populations in these areas may be maintained at 234 burros (1,404 AUMs). If livestock numbers are maintained at present levels, however, rangeland condition and productivity would probably decline in the long term. Declining condition and productivity could adversely affect the health of the wild burro herds. A herd of 234 burros with an annual increase of 17 percent would require the yearly removal of 40 burros to maintain a stable population. The herd would be exposed to short periods of stress during live capture operations.

LIVESTOCK GRAZING

Adjustments in Livestock Numbers

The continuation of present management alternative would allow livestock grazing to continue at its present authorized grazing preference of 74,417 AUMs without reserving forage for wild burros or big game. Grazing would continue to exceed the rangeland's carrying capacity, particularly where appreciable numbers of burros or big game occur. Livestock forage productivity would continue its gradual decline, and grazing animals would increase their reliance on ephemeral forage. The long-term desertification process would continue, diminishing the value of the rangeland for livestock production. The potential to produce vegetation would decline as the soil is depleted through erosion and the desirable vegetation is replaced by invading plants.

In the long term, as vegetation available for livestock grazing declines, ranchers would have to begin voluntarily reducing their herds. Within 20 years, operators would be licensing 5 percent below their present 5-year average licensed use or 28 percent below authorized grazing preference. Small ranches (0-150 head) and medium-size ranches (151-300 head) would be operating at 9 percent below their current 5-year average licensed use or 32 and 20 percent respectively below authorized grazing preference. Large ranches (over 300 head) would be operating at an average of 4 percent below their current 5-year average licensed use and 27 percent below their authorized grazing preference.

Ranching Operations

Continuation of present management would not affect existing livestock operations, and current grazing patterns would continue. Ranches in all size classes would continue to operate as at the present. Seasonal yearling operations would continue as seasonal operations and cow-calf operations could continue under yearlong grazing. Ranch values would slowly decline as the potential to support livestock declines.

Existing rangeland developments would be maintained, but new developments would be built only if needed for the orderly use of the range.

Livestock Performance

No action would involve no initial livestock reductions, and livestock would not have to adjust to new systems. In the short term, high stocking rates could increase livestock gains and ranch income. Over the long term, however, heavy stocking rates would decrease the ability of the rangeland to produce forage and sustain grazing. As the rangeland's ability to produce palatable vegetation decreases, livestock performance would also decrease. With the decrease in livestock performance, ranchers would have to reduce herd numbers voluntarily. Even with these reductions, calf weaning weights would be lower than they are now (see Table 4-10).

VISUAL RESOURCES

Through a gradual decrease in vegetation, the no-action alternative could change the color and texture of the existing landscape. Any change would be most evident along roads. Short-term and highly localized visual contrasts would result from rangeland developments. Contrast ratings will be completed for all rangeland developments to ensure that recommended VRM class objectives are met. For criteria and methodology, see BLM manual 8400.

CULTURAL RESOURCES

As shown in Table 4-11, the continuation of present grazing management proposes the addition of numerous rangeland developments and the continuation of current high stocking levels, which would result in overall high increases in impacts to cultural resources. The present trend toward greater deterioration of cultural resources would continue, especially by increased trampling and site erosion.

RECREATION

Continuation of present grazing management would measurably decrease hunting opportunities in the EIS area. Big-game populations are expected to decrease by 965 animals, decreasing annual participation in big-game hunting by an estimated 4,718 visitor days. Hunting visitor days for small and upland game could increase or decrease, depending on population changes, but these changes cannot be estimated with accuracy. Opportunities for viewing wildlife would slightly decrease with decreases in big game. See Table 4-13.

WILDERNESS VALUES

Lands in the EIS area proposed as WSAs are being managed according to BLM's *Interim Management Policy and Guidelines for Lands under Wilderness Review* (BLM, 1979b). No impacts on wilderness values are expected.

ECONOMIC AND SOCIAL CONDITIONS

Economic Conditions

Ranch Budgets

Small Ranch. Under continuation of present grazing management the average licensed use on the typical small ranch is expected to decrease gradually by 9 percent, with slight decreases in calf crops and calf weights over a 20-year period. Herd size would decrease from 67 to 61 head over 20 years, causing a decrease in net revenue from $2,215 to $1,707. The present value of the net revenue over a 30-year period on the small ranch under present management amounts to $23,582 (Table 4-14).

The gradual loss in net revenue would probably pose no major problems to the small operation, which would probably reduce herd sizes and continue subsidizing itself with outside income.

Medium-Size Ranch. Average licensed use on the typical medium size ranch is expected to decrease gradually by 9 percent with calf crops and calf weights decreasing slightly over 20 years. The typical ranch's herd size would decline from 212 to 193 head, and net revenue would fall from $10,567 to $8,592. The present value of 30-year net revenues on the medium-size ranch amounts to $115,647.

Large Ranch. The average licensed use on the typical large size ranch is expected to decrease gradually by 4 percent, with calf crops and calf weights decreasing slightly over 20 years. The large ranch's herd size would decline from 788 to 755 head. Annual net revenue would also decrease gradually from $18,435 to $13,692. The present value of 30 years of the ranch's net revenues amounts to $250,050. This reduction in ranch income would probably not highly affect ranches in this size class other than causing a gradual loss in net revenue.

Ranch Finance

Ranch market values are not expected to change under continuation of present management because authorized grazing preferences are expected to remain at existing levels. Long-term reductions in ranch net revenues may make it harder for individual ranch operations to obtain operating loans.

Regional Economics

Total gross receipts from the sale of livestock for the 30 ranchers in the EIS area would decline from

$1,279,540 to $1,163,590 over 20 years, reducing the EIS area's contribution to the county's livestock sales from 5.1 to 4.7 percent. Ranch operating expenses would decrease from $967,370 to $923,680. Total net revenue for the 30 ranches would decline from $312,170 to $239,910.

Ranch employment would decrease from 47.77 to 42.64 workyears. The reduced employment would decrease ranch-related earnings from $459,637 to $410,200 after 20 years.

Construction Income

Estimated earnings from the construction of range improvements—$142,730 per year for 5 years—would add 1 percent to Mohave County's total 1977 construction earnings of $14,178,000.

Recreation Earnings

Annual recreation use in the planning area would decrease by 4,718 visitor days after 20 years. Recreation-related spending would decline by $94,360, and recreation-related employment would drop by 2.42 workyears. The direct income contribution of outdoor recreation to Mohave County would decline by $20,328.

Benefit-Cost Analysis

Because of a lack of quantifiable information on the benefits expected under continuation of present grazing management, a benefit-cost analysis was not conducted.

Social Attitudes and Values

Social perceptions and attitudes of Mohave County residents are not expected to be measurably impacted as a result of a decision to implement the continuation of present grazing management.

SUMMARY

The implementation of the continuation of present management alternative would meet none of the 10 objectives listed in Chapter 1. This alternative would adversely impact vegetation, wildlife, wild burros, livestock, riparian and aquatic habitat, watershed, soils, recreation, cultural resources, and water quality.

IMPACTS OF MODERATE GRAZING MANAGEMENT

VEGETATION

Usable Forage Production

Moderate grazing management calls for allowing yearlong grazing under moderate forage utilization (45 percent) rather than applying grazing systems. The primary shortcoming of yearlong grazing is that it leads to excessive use in areas of concentration and to unused forage where livestock rarely graze. It also leads to a poor distribution of use among plant species, favored species being grazed more closely and more often than those less palatable (Martin, 1975b).

Yearlong grazing at appropriate stocking levels, however, is a reasonably good system. Many alternatives have been found not to be better than yearlong grazing, mainly because recovery during rest periods is offset by the impact of more rapid forage removal during the grazed period (Arizona Interagency Range Committee, 1973).

Vegetation allocation at 90 percent of the proposed action's stocking rate would maintain or improve production and reduce risk of overstocking in drought years (Martin, 1975a). Lower utilization of forage plants would improve plant vigor and increase reproduction and litter accumulation.

Under moderate grazing management, usable forage production would increase from 116 to 128 pounds per acre as shown on Table 4-1. The greatest increases would occur in the ponderosa pine (41 to 53 pounds per acre) and grassland vegetation (157 to 196 pounds per acre) types, and the smallest increase would occur in the creosotebush (72 to 74 pounds per acre) and paloverde (96 to 99 pounds per acre) types.

The construction of rangeland developments would disturb 204 acres of vegetation in the short term, but only 111 acres would be lost in the long term from construction and heavy grazing around new waters.

Plant Cover

Total plant cover would increase from 22 to 24 percent (Table 4-2), and desirable plants would replace undesirable plants. Cover would change the most in the grassland vegetation type (18 to 21 percent), and the least in the desert shrub type (26 to 27 percent).

Junegrass

Rangeland Condition

Rangeland condition acreage would change as follows: excellent from 20,724 to 176,339 acres; good from 280,791 to 287,627 acres; fair from 466,231 to 266,474 acres; and poor from 89,003 to 126,309. Projected rangeland condition by vegetation type is shown in Table 4-3 and by allotment in Appendix 4-1.

Key species composition would increase from 22 to 30 percent on 155,615 acres improving from good to excellent condition. On 6,836 acres improving from fair to good condition, key species composition would increase from 15 to 22 percent. On 266,474 acres remaining in fair condition, key species composition would remain at 15 percent. And on 37,306 acres declining from fair to poor condition, key species composition would drop from 15 to 8 percent (Table 4-4).

Riparian Vegetation

The vegetation allocation and the lower utilization would still leave riparian areas heavily grazed. The vigor of riparian vegetation would continue to decline, and woody riparian vegetation would not reproduce. New water developments would improve livestock distribution somewhat, but riparian vegetation would overall decline.

Usable forage production would decrease slightly from 165 to 163 pounds per acre. Riparian range condition acreage would change as follows: excellent from 0 to 37 acres; good from 37 to 0 acres; fair from 1,862 to 1,570 acres; and poor from 2,905 to 3,197 acres. Correspondingly, key species composition would increase from 22 to 30 percent on 37 acres changing from good to excellent condition. On 1,570 acres remaining in fair condition, the key species composition would remain at 15 percent. On 292 acres declining from fair to poor condition, key species composition would decrease from 15 to 8 percent. Cover in riparian areas would decrease from 26 to 25 percent.

Protected Plants

Protected plants would benefit slightly from the lower utilization, which would improve plant vigor and increase reproduction. Onsite field examinations before construction of rangeland developments would assure that endangered, threatened, or sensitive plants are protected.

SOILS

Erosion

With the exception of allotments proposed for nonintensive grazing management on 20,226 acres, moderate grazing management would increase total ground cover and decrease soil compaction and soil erosion.

The 9,384 acres in a critical-severe erosion condition and the 97,523 acres in a moderate erosion condition would improve over 20 years. In riparian areas, soils now in moderate to critical erosion condition should improve due to decreased grazing pressure from livestock and wild burros. These projections are based on the soil surface factors estimated during the BLM rangeland inventory and on erosion studies conducted by the Science and Education Administration, USDA, at the Walnut Gulch Experiment Station in southeastern Arizona (Arizona Inter-Agency Range Committee, 1972). Soil erosion condition would improve primarily due to a reduction in livestock grazing pressure. This improvement would allow for natural revegetation and an increase in total ground cover. See Table 4-5, Impacts on Soils.

Decreased vegetation production over the long term would result in increased soil erosion and further impacts to the soils on nonintensive allotments.

Finer textured soils in the EIS area, such as Springerville, Cabezon, and Thunderbird (soil association 12—Grassland soils) would improve the most under moderate grazing management.

Rangeland developments under moderate grazing management would temporarily disturb 204 acres of soil and permanently occupy 111 acres. The plants and soils disturbed would need an estimated 3- to 10-year period to recover (BLM, 1978b). The major impact to the soil would be the 111 acres permanently lost to rangeland developments, but this acreage is insignificant compared to the total EIS area. During the construction and recovery period, soil compaction and the removal of ground cover would increase erosion potential. But as vegetation and litter increase, soil erosion would decline. The short-term and long-term impacts—increased soil erosion and decreased ground cover—would be insignificant when compared to the total soil erosion in the EIS area. See Table 4-6, Soil Impacts—Rangeland Developments.

Sediment Yield

Moderate grazing management would reduce sediment yield by 0.01 acre-feet/square mile/year over a 20-year period. This change would result from increased ground cover and reduced grazing pressure and soil erosion (see Table 4-7).

WATER RESOURCES

Water Quantity

Moderate grazing management would increase present storage facilities by 26.6 acre-feet, decreasing existing surface water. Consumption would increase by 2 acre-feet to 41 acre-feet for burros, livestock, and big-game.

Runoff is expected to decrease as infiltration increases. Increased infiltration would result from increased cover (Lyford and others, 1969; Branson, Gifford, and Owen, 1972) and larger soil moisture deficits caused by increased vegetation (Cable, 1980).

Because transpiring vegetation consumes more soil moisture than evaporation from bare ground (Cable, 1980), the increased deficit in soil moisture storage would reduce the probabilities of high soil moisture conditions and reduce the size and frequency of floods. This process would require a long period of reduced grazing intensities and rest and might be significant only on the small watershed scale.

The quantity of ground water would decrease from present levels in local aquifers as nine new wells are developed (0.5 acre-feet total storage). These local impacts, however, would not significantly affect the total water resources in the area.

Water Quality

The pollution caused by increased wildlife would partially offset the benefits of reduced livestock numbers. Moreover, because livestock prefer riparian zones (Platts, 1979), the reduction in livestock might not reduce livestock concentration near water. Increased wildlife and selective livestock grazing might increase fecal coliform in the area's streams. Sediment and nutrients would not decrease under moderate grazing based on livestock preference for riparian areas.

Moderate grazing management would not affect ground water quality if wells are properly located and designed.

WILDLIFE

This section analyzes the impacts of moderate grazing management on habitat components—food, water, cover, and space—that are modified by features of the alternative—grazing adjustments and rangeland developments. Table 4-18 summarizes the impacts of this alternative on wildlife.

Grazing Adjustments

Under moderate grazing management livestock numbers would initially be adjusted to 90 percent of the proposed action's stocking levels, and grazing would be adjusted as necessary to achieve an average utilization of key forage species of no more than 45 percent. Wild

TABLE 4-18
WILDLIFE AND HABITAT IMPACT RATINGS UNDER MODERATE MANAGEMENT[1]

Alternative's Features	Big Game					Special Status Species		Upland and Small Game	Nongame Wildlife	Riparian Habitats
	Mule Deer	Elk	Bighorn Sheep	Pronghorn Antelope	Javelina	Federal-Listed Threatened/ Endangered Species	Other Protected Species[2]			
Grazing Use										
Vegetation Production Available Initially	3	3	3	3	3	3	4	4	4	3
Vegetation Production Available in 5 years	4	4	3	4	4	3	4	4	4	2
Vegetation Production Available in 20 years	4	4	4	4	4	3	4	4	4	2
Levels of Grazing Management										
Intensive	NA	—	—	—	—	—	—	—	—	—
Less Intensive	3	3	3	3	3	4	4	4	4	2
Nonintensive	2	NA	NA	NA	3	3	2	3	2	2
Ephemeral	4	NA	NA	NA	3	4	4	4	4	3
Management Facilities										
Water Developments	4	3	3	3	4	NA	3	4	3	2
Fencing	3	3	3	3	3	NA	NA	NA	NA	NA
Totals (Average)	3.4	3.3	3.2	3.3	3.4	3.3	3.6	3.9	3.6	2.3
Average Rating for Alternative 3.3						Average Rating for Existing Situation 2.5				

[1] The rating system is as follows: 1 = most significant downward trend; 2 = downward trend; 3 = relatively static; 4 = upward trend, 5 = most significant upward trend; NA = not applicable.
[2] Proposed threatened or endangered species, State-listed species, BLM sensitive species.

burro numbers would be reduced to the level called for in the proposed action.

Big Game

In the long term, the forage productivity of elk habitat would increase by 15 percent in the Hualapai Peak and Yellow Pine allotments. The increase would occur mostly on perennial grasses and forbs used by both elk and cattle. Over 15,000 acres would improve above fair rangeland condition, resulting in less forage competition in the long term. Cattle and elk would compete less for space due to short-term livestock reductions. In the long term, forage would increase enough to support 26 elk on public lands (Table 4-9).

The productivity of mule deer habitat would increase 10 percent in the long term, the largest increases affecting mule deer on Boriana, Francis Creek, Groom Peak, Hualapai Peak, Walnut Creek, Kent's Cane Spring, and Lines allotments. Competition for forage and space would greatly decrease in the short term (Hawkes and Furlow, 1978) as over 162,000 acres in the EIS area improve to the good and excellent range condition classes. In the long term, the EIS area would produce enough forage for an additional 697 deer.

Forage production on pronghorn habitat would increase by only 2 percent. Reducing livestock numbers on Francis Creek and McElhaney allotments would nearly eliminate livestock-pronghorn competition for forage. Production increases on these two allotments, however, would be partly offset by declines on Sweetmilk allotment (proposed for nonintensive grazing), where livestock, wild burros, mule deer, and pronghorn would heavily compete for forage. The average 45 percent utilization of grasses and forbs would result in a 17 percent long-term increase in cover. This increase, in turn, would partially meet pronghorn requirements for cover and space. Long-term increases in forage would allow for an additional 14 pronghorn in the EIS area.

Long-term forage productivity in desert bighorn sheep habitat would increase by 2 percent. Over 21,000 acres would improve from poor and fair to good range condition, allowing bighorn to use more of the Artillery Range, Bateman Spring, and Chicken Springs allotments. The foothills would be more usable by bighorn due to improved forage conditions and less competition for space. In the long term, forage would increase enough to support 11 more bighorn.

Javelina would increase and widen their distribution throughout the planning area in the long term. Reduced forage competition between all users would allow a long-term javelina increase of over 1,000 animals.

Other Wildlife

Expected reductions in riparian plant cover (Table 4-2) and continued disturbance by livestock in riparian habitat and at water sources would cause waterfowl and shorebird habitat to deteriorate by about 8 percent.

The productivity of upland and small-game habitat would increase by about 10 percent in the long term. Gambel's quail populations would fluctuate less, and during good rainfall years populations could be higher than at present. Band-tailed pigeons would increase due to increases in mast and fruit-producing shrubs and due to lower utilization (45 percent) of the plants. A lessening of nest disturbance by livestock might slightly increase mourning dove populations, especially where they ground-nest. On the other hand, white-winged dove habitat would continue to decrease with the continued 8 percent long-term deterioration of riparian habitat cover.

Desert cottontail and jackrabbit populations would probably not significantly change except on the Chicken Springs and La Cienega allotments, where populations might fluctuate less and decrease (Peck, 1979).

Nongame habitat would benefit from moderate grazing management. The 10 percent increase in forage production, 9 percent increase in plant cover, and 11 percent increase in grass heights would primarily improve the lower layers of vegetation needed for cover by many nongame species.

About 392,000 acres would still lack sufficient low-level ground cover, but areas of improved habitat condition would increase by 55 percent.

The quality of nongame riparian habitat would decline substantially, and riparian areas would remain far below their potential.

Protected and Sensitive Species

Protected and sensitive wildlife habitat would continue to degrade for some species and moderately improve for others. The aquatic and riparian bald eagle habitat would decline in productivity. Fewer roost trees would remain, and prey populations would decline (Kepner, 1979). In the long term, use of the upper Bill Williams drainage would diminish to the point that bald eagles might cease to winter in the EIS area.

Potential peregrine habitat would remain in the EIS area, but in the long term it is not likely to support breeding pairs.

Long-term forage productivity would increase by 9 percent in desert tortoise habitat. Cattle and tortoises

would compete slightly less for forage in the short term, but such competition would not significantly decline on winter-spring annuals. Desert tortoise populations might slightly increase in the long term due to increased chances to reproduce.

In the short term, Bell's vireo habitat would remain about the same as at present. Bell's vireo nest in riparian habitats that are in good condition. The few sites in the EIS area where the vireo breeds would probably remain usable in the short term. In the long term the vireo would be found only on 37 acres of Pine Creek and parts of Francis Creek.

Black hawk populations would remain the same in the short term. In the long term, black hawk habitat and populations would decline sharply as nest trees die out, resulting in a lack of suitable nesting habitat. By the end of the 20-year period few black hawks would remain in the EIS area. Cumulative effects of other actions in the Burro Creek drainage could speed up the adverse short-term and long-term trends.

Zone-tailed hawks would be less affected than black hawks because of their wider foraging and breeding distribution. In the long term, however, zone-tailed hawks would decrease as suitable nest trees near springs and along riparian drainages become rarer.

Great egrets, snowy egrets, and black-crowned night herons would continue to use stock tanks, denuded areas around Alamo Lake, and sections of Burro Creek and the Big Sandy River as stopovers during migration. These birds, however, would probably not breed in the EIS area.

Gilbert's skink populations would increase in the long term due to a 5 percent increase in plant cover in preferred vegetation types.

Gila monster habitat would improve primarily due to increases in prey base. Prey would increase as a result of the 6 percent long-term increase in plant cover.

The Sonoran mountain kingsnake would increase as its prey base increases. The kingsnake's prey would increase with the 7 percent increase in plant cover in the pinyon-juniper and ponderosa pine vegetation types.

The Hualapai vole would benefit from the moderate grazing alternative, which would increase its food and cover plants. Cover would increase by 6 percent. Utilization of 45 percent would allow an 11 percent increase in grass height, not enough to meet cover heights of 10-14 inches. In the long term the vole would probably not be State-listed.

The ferruginous hawk would continue to winter in the EIS area and might breed due to an improved grassland aspect over 10,000 acres of habitat.

Riparian Habitat

Riparian habitat quality would continue to degrade due to continued heavy grazing of its palatable plants. Although rangeland condition would remain about the same, trends in habitat quality would continue to decline due to nonreplacement of cottonwood, willow, and ash trees. Dependent wildlife species previously discussed would no longer inhabit the EIS area or would be greatly reduced. This alternative would not fully meet BLM's objectives for protection or improvement of riparian ecosystems (BLM Manual 6740; Almand and Krohn, 1978).

Management

Moderate grazing management calls for no grazing treatments or rest of pastures. Impacts from the management of perennial-ephemeral, ephemeral, and nonintensive allotments would be the same as those occurring under the proposed action. See Wildlife under the Proposed Action section of Chapter 4.

Rangeland Developments

Moderate grazing management proposes slightly more than half the rangeland developments of the proposed action. Two types of facilities are proposed: water developments and fences.

Waters

Over 80 water developments are proposed for all allotments (Table 2-5). Of these, 78 would provide year-round water. With BLM's standard protection around waters, 2,800 acres would deteriorate around the developments due to concentrated grazing.

Increased water availability would be a boon to some wildlife species, as water is a primary limiting factor affecting habitat quality in much of the desert covering 71 percent of the planning area. On the other hand, some species would be adversely affected.

Water is not limiting for elk at present, but increased water availability from three new waters in elk habitat would reduce spatial competition between cattle and elk.

Additional waters in mule deer habitat would increase individual foraging ranges of deer. Thirty water developments would significantly extend the range of livestock into areas previously lightly grazed, increasing

competition with deer for browse, increasing spatial competition, and reducing cover. The water developments would also expand the ability of deer to forage in new areas.

Pronghorn antelope would slightly benefit from eight waters in new areas by expanding areas of available forage. The increased area used by livestock in crucial pronghorn habitat would create a substantial short-term and long-term adverse impact on forage and cover.

Bighorn sheep would be adversely impacted by four new livestock waters, which would increase bighorn-livestock competition for forage and space.

Increased water availability would benefit javelina by increasing the area from which they gather forage.

Waterfowl and shorebirds would benefit directly from each additional water by having more stopover sites during migration and wintering and breeding sites at the larger developments.

Upland and small game would benefit from additional waters with surrounding exclosures because the relationship of protected areas, disturbed areas, and surrounding habitat would create edges or ecotones (Leopold, 1933), which could provide unique sources of food and cover (Dick-Peddie, 1976; Thomas, Maser, and Rodiek, 1978).

Of the more than 300 nongame species in the EIS area, no more than 30 species of birds and mammals would benefit from additional livestock waters (Elder, 1953; Wright, 1959). Nongame habitat in the disturbed areas would be severely impacted due to a reduction in plant cover and increase in soil compaction similar to that described by Busack and Bury (1974).

The impacts of new waters on protected and sensitive wildlife would vary. The bald eagle, peregrine falcon, and Bell's vireo would not be affected by additional waters. Water developments in desert tortoise crucial habitat, however, would concentrate livestock where the likelihood would increase for forage competition and deaths due to trampling.

Except for the Haulapai vole and the Sonoran mountain kingsnake, additional water developments would not significantly impact other protected or sensitive wildlife. Each of six proposed waters would seriously impact at least 40 acres of the 6,000 acres of vole and kingsnake habitat.

Water developments would impact riparian habitat differently, depending on their location. Waters within 2 miles of riparian habitat would not improve riparian quality, since such waters would not effectively draw livestock away from riparian corridors. Conversely, waters beyond 3 miles from riparian areas would attract livestock into other foraging lands and result in a slight long-term slackening of cattle grazing in the riparian corridor. Improved water distribution, however, would not measurably improve the quality of riparian habitat.

Fences

The 129 miles of fencing extending through 28 allotments would permanently disturb 13 acres of habitat but would significantly impact only big game.

New fences in elk habitat would extend a maximum of 5 miles and would have the adverse short-term and long-term impacts of blocking elk movement and upsetting existing use patterns.

Although fences would be designed to reduce deer mortality, an unknown number of deer would die by entanglement while trying to cross them. New fences would initially disrupt established use patterns.

Fifteen miles of new fence would block pronghorn movement in crucial pronghorn habitat (Map 2-3) and cause additional deaths, even though the fences would be constructed to safe specifications. The herds on Goodwin and Bozarth Mesas would be slightly more compartmentalized, but the short-term and long-term effects are not known.

Bighorn sheep would be adversely impacted by 15 miles of new fence in or near their crucial habitat (Map 2-3). More fencing would increase bighorn mortality and block freedom of movement. Javelina and riparian habitat would not be significantly affected by fencing proposed under this alternative.

Fire

Moderate grazing management would increase wildfire frequency by increasing by 7 percent the amount of fuel produced. If significant acreage is allowed to burn, wildfire in the pinyon-juniper, grassland, chaparral, and desert shrub vegetation types would result in an increased production of forage and cover, especially forbs and browse. Wildfires would also speed up beneficial habitat changes in chaparral and grassland vegetation types, improving their rangeland condition (Stoddart and Smith, 1955). Improved rangeland condition in these vegetation types would benefit mule deer, pronghorn antelope, Gilbert's skinks, Gila monsters, golden eagles, prairie falcons, merlins, and the zone-tailed, sharp-shinned, Cooper's, and ferruginous hawks (BLM, 1980a;b).

WILD BURROS

The impacts to wild burros from the moderate grazing management alternative would be similar to those expected under the proposed action. The lower level of livestock use under moderate grazing, however, would benefit burros by decreasing competition for forage. BLM would initially remove 704 burros from the EIS area to maintain a population of 139. During re-

Terrain Influences Rangeland Suitability

Some range sites in the EIS area are too steep to be efficiently grazed by livestock. In its rangeland inventory, BLM classified such sites as unsuitable for livestock grazing.

moval, burros might undergo slight stress, but few are expected to die. If the burro herd increases 17 percent annually, 24 burros would have to removed each year.

LIVESTOCK GRAZING

Adjustments in Livestock Numbers

Under moderate grazing management, livestock numbers on Federal and controlled lands would initially be reduced by 44 percent from the present 5-year average licensed use and 58 percent from authorized grazing preference. (See Table 2-1). Initial reductions would impact the medium-size ranch class (151-300 head) more severely than the large (over 300 head) and small (0-150 head) ranches. Stocking on medium-size ranches would at first be reduced by an average of 51 percent (57 percent from authorized grazing preference), stocking on large ranches reduced by an average of 37 percent (55 percent from authorized grazing preference), and stocking on small ranches reduced by 43 percent (58 percent from authorized grazing preference).

Livestock numbers on all ranch sizes would increase over the long term, as rangeland condition improves and rangeland productivity increases. Twenty years after implementation, medium-size ranches could expect a 26 percent average increase above the initial reduction level, and large and small ranches could expect a 19 and 20 percent average increase, respectively. These levels would still be below current 5-year average licensed use by 32 percent for the small ranches, 38 percent for the medium-size ranches, and 25 percent for the large ranches.

Ranching Operations

No intensive management systems would be implemented. Less intensive management would be required on 32 allotments, affecting all or parts of all medium-size ranches and all but one large ranch. (JJJ would be managed as nonintensive.) Nonintensive and ephemeral grazing would be allowed on the same allotments as under the proposed action.

Less intensive management would require less of the rancher's time for monitoring and moving livestock. Existing rangeland developments would be maintained, and additional improvements would be constructed to allow for better livestock distribution. Additional labor would be required to maintain these new developments.

Livestock Performance

The stocking rates would be lower on most ranches because of initial herd reductions. Lower stocking rates would generally give each grazing animal more forage than presently exists. The lower stocking rates would improve rangeland conditions and increase the more desirable forage species for livestock, allowing an increase in weight gains and percent calf crops and a decrease in the percent of cows culled from a herd (see Table 4-10).

Moderate grazing management would allow a sustained production of beef, which should make ranching operations more stable in the EIS area.

VISUAL RESOURCES

Increases in vegetation under moderate grazing management could change the color and texture of the existing landscape. Change would occur gradually, being most evident along roads. Short-term and highly localized visual contrasts would result from rangeland developments. Contrast ratings will be completed for all rangeland developments to ensure that recommended VRM class objectives are met. For criteria and methodology, see BLM Manual 8400.

CULTURAL RESOURCES

Under moderate grazing management, impacts on cultural resources would moderately decrease (Table 4-11). Impacts from trampling and rubbing would be reduced since stocking levels would be almost half of present levels. Impacts from construction of rangeland developments would be similar in character to those expected under the proposed action, but to a much smaller degree. Moderate grazing would lessen the deterioration of sites, since site erosion would decrease as vegetation cover improves. Vandalism would probably continue and might increase slightly because of new access to rangeland developments.

RECREATION

Moderate grazing management would measurably impact only hunting. Big-game populations are expected to increase by 2,923 animals, increasing big-game hunting by an estimated 18,112 visitor days per year. Changes in small and upland game could increase or decrease hunter use visitor days, although these figures cannot be estimated with accuracy. Increases in game would slightly increase opportunities for viewing wildlife. See Table 4-13.

WILDERNESS VALUES

On lands in the EIS area proposed as wilderness study areas, all rangeland management activities will comply with BLM's *Interim Management Policy and Guidelines for Lands under Wilderness Review* (BLM, 1979b). No impacts on wilderness values are expected.

ECONOMIC AND SOCIAL CONDITIONS

Economic Conditions

Ranch Budgets

Over a 30-year period, ranches of all three sizes would be financially better off under present management than under moderate grazing management.

Small Ranch. Under moderate grazing management, the typical small ranch would undergo a short-term 43 percent herd reduction from 67 to 38 head. AUM increases, however, would allow the herd size to gradually increase to 42 head after 20 years, an 11 percent increase above the short-term reduction. Initially, annual net revenues would decline from $2,215 to $977 per year, but increased AUMs, calf crops, and calf weights would increase annual net revenue to $2,101 after 20 years. The present value of 30 years of net revenues for the typical small ranch under present grazing management amounts to $23,582, whereas such revenues under moderate grazing management amount to $18,723 (Table 4-14).

Medium-Size Ranch. The typical medium-size ranch would undergo a short-term 51 percent reduction in herd size from 212 to 103 head, but increases in forage production would allow the herd size to increase to 127 head after 20 years, a 23 percent increase over the short-term reduction. Net revenue would temporarily decrease from $10,567 to $4,146 but increase to $7,735 after 20 years. The present value of 30 years of net revenues under present grazing management amounts to $115,647, whereas such revenues under moderate grazing management amount to $72,358.

Large Ranch. The typical large ranch would undergo a 41 percent herd size reduction from 788 to 464 head, but increases in forage production would allow the herd size to increase 18 percent to 548 head. Annual net revenue would temporarily decrease from $18,435 to $6,984 but after 20 years would increase to $21,945. The present value of 30 years of net revenues under existing grazing management amounts to $225,829, whereas such revenues under moderate grazing management amount to $175,470.

Ranch Finance

In the short term, ranch market values on the typical small ranch would decrease from $131,625 to $57,000 but would increase to $75,600 over the long term. On the medium-size ranch, market values would decrease from $412,500 to $154,500 but increase to $228,600 in the long term. On the typical large ranch, market values would decrease from $1,394,750 to $696,000. Long-term AUM and productivity increases would increase the market value of the typical large ranch to $986,400.

Regional Economics

Under moderate grazing management total gross receipts from the sale of livestock for the 30 EIS area ranchers would decrease from $1,279,540 to $727,940 in the short term, reducing the rancher's contribution to Mohave County's livestock sales from 5.1 to 2.9 percent. In the long term, total annual ranch receipts would increase to $1,010,810 or to 4 percent of the county total.

Annual ranch operating expenses would decrease from $967,370 to $606,870 in the short-term but would rise to $693,000 after 20 years. Net revenues for the 30 ranches would decline from $312,170 to $121,070, gradually increasing to $317,810 after 20 years.

Annual ranch labor requirements would decrease from 47.77 to 24.96 workyears over the short-term, but after 20 years they would rise to 32.38 workyears. Annual earnings from ranch employment would decrease from $459,637 (1.5 percent of the county's total agricultural earnings) to $240,115 (0.8 percent of the county's total). After 20 years, annual earnings from the planning area's livestock industry are expected to rise to $311,496 or 1 percent of the county's total.

Construction Income

Estimated earnings from the construction of rangeland developments—$142,730 per year for 5 years—would add 1 percent to the county's total 1977 construction earnings of $14,178,000.

Recreation Earnings

Moderate grazing management after 20 years would increase annual recreation use in the planning area by 18,112 visitor days. Recreation-related expenditures would increase by $362,240, increasing employment by 9.29 workyears and adding $78,021 of direct income to Mohave County's economy.

Benefit-Cost Analysis

A benefit-cost analysis was conducted for 29 of the 45 grazing allotments in the EIS area. Of the 16 allotments not analyzed, 4 are proposed for ephemeral grazing, and 12 are not proposed for rangeland developments.

The overall benefit-cost ratio for rangeland developments under moderate grazing management amounts to 1.77:1. This ratio, however, is useful only for comparing the total benefits and costs involved in each alternative. On an allotment-by-allotment basis, developments proposed for 13 of the allotments were found to have benefit-cost ratios greater than 2:1; developments proposed for 6 allotments were found to have benefit-cost ratios between 1:1 and 2:1; and developments for 10 allotments were found to have benefit-cost ratios below 1:1.

Social Attitudes and Values

Social perceptions and attitudes of Mohave County residents are not expected to be measurably impacted as a result of a decision to implement the moderate grazing alternative.

SUMMARY

If implemented, the moderate grazing management alternative would meet all or portions of seven of the objectives listed in Chapter 1. Objectives would be met for reducing soil erosion and sedimentation, maintaining a viable burro herd, improving wildlife habitat on public lands, and protecting special areas of cultural, historical, scenic and scientific value. This alternative would partially protect and improve sensitive wildlife habitat for some species but continue to degrade habitat for others. Objectives for stabilizing livestock operations and improving rangeland condition would also be met. Usable forage production would increase but not to the level established in the objective. This alternative would not meet the objectives of improving water quality in the two major watershed areas and improving riparian communities along major drainages.

IMPACTS OF WILDLIFE ENHANCEMENT

VEGETATION

Usable Forage Production

Benefits to vegetation under the wildlife enhancement alternative would be similar to those expected under the proposed action. Vegetation allocation and would increase the most in usable forage production

minimum rest periods are expected to improve vegetation production, plant vigor, seedling establishment, and litter accumulation. Usable forage production would increase from 116 to 138 pounds per acre as shown on Table 4-1. The grassland vegetation type would increase the most in usable forage production (157 to 218 pounds per acre), and the Joshua tree (116 to 126 pounds per acre), paloverde (96 to 105 pounds per acre), and creosotebush (72 to 81 pounds per acre) types would increase the least.

Plant Cover

Plant cover is expected to increase from 22 to 25 percent (Table 4-2). Key species cover would increase as these species regain vigor and more seedlings become established. Less desirable plants would decrease in cover as desirable plants become established. The greatest change in cover would occur in the grassland vegetation type (18 to 24 percent), and the smallest change would occur in the chaparral (44 to 47 percent) and the desert shrub (26 to 28 percent) types.

Rangeland Condition

Rangeland condition acreage would increase as follows: excellent from 20,724 to 247,279 acres; good from 280,791 to 415,407 acres; fair from 466,231 to 142,340 acres; and poor from 89,003 to 51,723 acres. Projected rangeland condition by vegetation type is shown in Table 4-3 and by allotment in Appendix 4-1.

Average key species composition would increase from 22 to 30 percent on 226,555 acres improving from good to excellent condition. On 134,616 acres improving from fair to good condition, key species composition would increase from 15 to 22 percent. The key species composition on the remaining 142,340 acres in fair condition would remain at 15 percent. Similarly, key species composition on the remaining 51,723 acres in poor condition would remain at 8 percent (Table 4-4).

Construction of rangeland developments would temporarily disturb 392 acres of vegetation and permanently disturb 197 acres of vegetation. Long-term loss of vegetation would result from the facilities replacing vegetation and from the trampling and grazing of livestock, big game, and burros on areas surrounding new water developments. These losses, however, would be small in comparison to the increased benefits of lower utilization on the entire allotment and to improved vigor, composition, and production around existing waters.

Riparian Vegetation

Wildlife enhancement would improve riparian vegetation. The fencing of riparian areas to exclude livestock and wild burros would immediately improve vigor and production of the overutilized vegetation. Fencing of livestock from riparian areas appears to be the only certain way to assure protection (Moore and others, 1979). Cottonwood, willow, mesquite, and saltcedar would soon dominate the overstory, and grasses and forbs would dominate the understory.

Usable forage production would increase from 165 to 212 pounds per acre, and cover would increase from 26 to 39 percent. Range condition acreage would change as follows: excellent from 0 to 163 acres; good from 37 to 4,431 acres; fair from 1,862 to 210 acres; and poor from 2,905 to 0 acres. Percent key species composition would increase as condition classes improve.

Protected Plants

Wildlife enhancement's minimum rest requirement and its vegetation allocation would benefit protected plants by lowering utilization, improving plant vigor, and increasing reproduction. Onsite field examinations before construction of rangeland developments would assure that endangered, threatened, or sensitive plants are protected.

SOILS

Erosion

Except on 20,226 acres proposed for nonintensive management, the wildlife enhancement alternative would reduce soil compaction, soil erosion, and sediment yield.

The 9,384 acres in a critical-severe erosion condition and the 97,523 acres in a moderate erosion condition would improve over the next 20 years. In riparian areas, soils now in moderate to critical erosion condition would improve due to decreased grazing pressure from livestock and wild burros, which would result in less trampling, increased vegetation production, and an increase in total ground cover. See Table 4-5, Impacts on Soils. These projections are based on the future soil surface factors estimated during the BLM rangeland inventory and on erosion studies conducted by the Science and Education Administration, USDA, at the Walnut Gulch Experiment Station in southeastern Arizona (Arizona Inter-Agency Range Committee, 1972).

On nonintensive allotments, long-term decreases in vegetation production would result in increased soil erosion and further declines in soil conditions.

Although most soils in the EIS area would benefit from wildlife enhancement, finer textured soils, such as

Vegetation Production Influences Rangeland Suitability

Scattered throughout the EIS area are sites producing little perennial forage—less than 25 pounds per acre. On such sites BLM will not allocate forage to livestock until forage production increases through management.

the Springerville, Cabezon and Thunderbird (soils association 12—Grassland soils) would improve the most.

Construction of rangeland developments under the wildlife enhancement alternative would temporarily disturb 392 acres of soil and permanently occupy 197 acres. The plants and soils disturbed would need an estimated 3- to 10-year period to recover (BLM, 1978b). The major impact to the soil would be the 197 acres permanently lost to rangeland developments, but this acreage is insignificant compared to the total EIS area. During the construction and recovery period, soil compaction and the removal of ground cover would increase erosion potential. But as vegetation and litter increase, soil erosion would decline. The short-term and long-term impacts—increased soil erosion and decreased ground cover—would be insignificant when compared to the total soil erosion in the EIS area. See Table 4-6, Soil Impacts—Rangeland Developments.

Sediment Yield

Sediment yield would decrease by 0.01 acre-feet/square mile/year. Ground cover would increase, and livestock grazing and upland erosion would decrease (Table 4-7).

WATER RESOURCES

Water Quantity

Under wildlife enhancement, decreased runoff and increased water consumption would slightly decrease local surface water supplies in the long term. New storage facilities would increase storage capacity by 22.9 acre-feet. Water consumption would increase to 42 acre-feet for burros, livestock and big game, an increase of 3 acre-feet over present consumption.

Runoff, infiltration, and floods would respond similarly to the proposed action. Runoff should decrease, soil moisture storage increase, and flood peaks decrease in frequency and size.

Ground water quantity would decrease insignificantly in local aquifers where 12 new wells would be dug. Storage of ground water would increase by 0.6 acre-feet.

Water Quality

The wildlife enhancement alternative would impact water quality in the same manner as would the

elimination of livestock grazing. Wildlife enhancement would reduce grazing intensity, eliminate grazing in the Burro Creek allotment, and fence riparian areas to exclude livestock grazing. Nutrients and sediment would decrease as riparian areas are protected. Fecal coliform could increase due to increased wildlife populations in the long term, but the sources of fecal coliform contamination are unknown. If livestock rather than wildlife is the main contributor, fecal coliform counts would decrease.

Wildlife enhancement would not affect ground water quality.

WILDLIFE

The analysis of the impacts of the wildlife enhancement alternative focuses on habitat improvement through changes in vegetation caused by changes in livestock management. Table 4-19 summarizes impacts of this alternative on wildlife.

Grazing Adjustments

Under wildlife enhancement, livestock numbers would be reduced 20 percent below numbers called for by the proposed action, and wild burros would be reduced to the level recommended in the proposed action. Forage competition between big game, livestock, and burros would be relieved by stocking at less than carrying capacity. Moreover, increased forage would be allocated to big game, allowing for faster population increases through the short term.

Big Game

The forage productivity of elk habitat would increase by 28 percent in the Yellow Pine and Hualapai Peak allotments. Perennial grasses and forbs used by both elk and cattle would increase the most. Over 17,000 acres would improve above fair rangeland condition, resulting in less short-term and long-term forage competition. Also in the short and long term, cattle and elk would compete less for space. Forage would be made available for 26 elk in the short term and at least 30 elk in the long term. Forage production on elk habitat would significantly increase in the short term.

Forage productivity on mule deer habitat would increase 19 percent, the largest increases occurring on the following allotments: Artillery Range, Big Sandy, Boriana, Burro Creek Ranch, Francis Creek, Groom Peak, Hualapai Peak, and Kent's Cane Spring. Competition for forage and space would greatly decrease (Hawkes and Furlow, 1978) in the short and long term, since over 360,000 acres of deer habitat would improve to good and excellent range conditions.

In the short term, forage would be allocated to an additional 740 deer, and in the long term, forage would be available for an additional 664 deer (Table 4-9). Forage would significantly increase and habitat significantly improve in the short term. Improvement would level off over the long term, however.

Forage production in pronghorn antelope habitat would increase by 29 percent, mostly on the Francis Creek allotment. The Sweetmilk allotment would continue to decline as it would under continuation of present management. On the McElhaney and Francis Creek allotments, competition for forage and space would end, with extra forage available for pronghorn in the short term. Pronghorn cover requirements would be met with 40 percent utilization (taller plants) and a cover increase of 33 percent. Habitat would markedly improve in the short term, slowing over the long term. In the long term, forage would be available for an additional 69 pronghorn.

The forage productivity of desert bighorn habitat would increase by 13 percent, mostly in the short term. Bighorn-cattle competition for forage and space would be nearly eliminated. Over 26,000 acres would improve from poor and fair rangeland condition to good and excellent rangeland condition, allowing bighorn to use more of the Artillery Range, Bateman Spring, and Chicken Springs allotments. The foothills would be more usable in the short and long term due to improved forage conditions. In the long term, forage would be available for at least 21 bighorn sheep.

Javelina would continue to increase their numbers and improve their distribution through the EIS area. Reduced forage competition among all users would allow javelina to continue their population increase in the short term and number 1,000 in the long term.

Other Wildlife

A 50 percent increase in plant cover (Table 4-2) would dramatically improve the quality of waterfowl and shorebird habitat around Alamo Lake, riparian areas, and larger stock tanks. Short-term changes would be great, and waterfowl breeding in the EIS area would probably increase in the long term.

Forage productivity of upland and small-game habitat would increase by 19 percent, much of the habitat improving in the short term. Gambel's quail populations would fluctuate less, and during good rainfall years populations could be higher than at present. Band-tailed pigeons would increase due to increases in mast and fruit-producing shrubs and due to lower utilization (40 percent) on plants.

Mourning dove populations would increase slightly due to a 14 percent increase in nesting cover and a lessening of nest disturbance by livestock, especially where doves ground-nest.

TABLE 4-19
WILDLIFE AND HABITAT IMPACT RATINGS UNDER WILDLIFE ENHANCEMENT [1]

Alternative's Features	Big Game					Special Status Species		Upland and Small Game	Nongame Wildlife	Riparian Habitats
	Mule Deer	Elk	Bighorn Sheep	Pronghorn Antelope	Javelina	Federal-Listed Threatened/ Endangered Species	Other Protected Species[2]			
Grazing Use										
Vegetation Production Available Initially	4	4	4	5	3	3	4	4	4	4
Vegetation Production Available in 5 years	4	4	4	5	4	4	4	4	4	5
Vegetation Production Available in 20 years	5	5	4	5	4	4	5	4	5	5
Levels of Grazing Management										
Intensive	4	4	4	4	4	4	3	4	3	NA
Less Intensive	4	NA	NA	NA	4	4	4	4	4	NA
Nonintensive	2	NA	NA	NA	3	3	2	3	2	NA
Ephemeral	4	NA	NA	NA	3	4	4	4	4	NA
Management Facilities										
Water Developments	4	4	4	4	4	NA	4	4	4	4
Fencing	3	3	3	3	3	NA	NA	NA	NA	5
Totals (Average)	3.8	4.0	3.8	4.3	3.6	3.7	3.8	3.9	3.8	4.6
	Average Rating for Alternative 3.9					Average Rating for Existing Situation 2.5				

[1] The rating system is as follows: 1 = most significant downward trend; 2 = downward trend; 3 = relatively static; 4 = upward trend, 5 = most significant upward trend; NA = not applicable.
[2] Proposed threatened or endangered species, State-listed species, BLM sensitive species.

In the long term, as riparian habitat regenerates, cover in white-winged dove habitat would increase by 50 percent, and dove numbers would correspondingly increase.

Jackrabbit and desert cottontail populations would probably not significantly change in the EIS area, except on Chicken Springs and La Cienega allotments, where populations might fluctuate less and decrease slightly (Peck, 1979).

Major changes would occur on nongame habitat. The 19 percent increase in forage production, 14 percent increase in plant cover, and 25 percent increase in grass heights would primarily affect the lower layers of vegetation needed for cover by many nongame species. The area of sufficient low-level cover on public lands would increase by 187 percent in the long term. In addition, riparian habitat, required by over half of the wildlife species in the planning area, would greatly improve.

Protected and Sensitive Species

Protected and sensitive wildlife habitat would improve for all species. The productivity and cover of aquatic and riparian bald eagle habitat would greatly increase. The number of roost trees would increase in the long term. Prey populations would increase in the short and long term to the point where bald eagles might breed in the upper Bill Williams drainage.

Increased prey populations in riparian drainages along Burro Creek and parts of the Santa Maria and lower Big Sandy Rivers would improve potential peregrine falcon habitat, which would be more likely to support breeding peregrines in the long term.

Forage productivity in desert tortoise crucial habitat would increase by 17 percent in the long term, and competition for winter-spring annuals would be nearly eliminated in the short term. In the long term, desert tortoise populations would increase or stabilize at above 50 tortoises per square mile.

With improved condition, Bell's vireo habitat would increase from 37 acres at two sites to over 4,500 acres.

In the long term, black hawk populations might increase with improved riparian and aquatic habitat condition. Even with complete protection from grazing, in the long term a lag would occur between the time overmature trees die out in the Burro Creek drainage and the time regenerating trees become large enough for nesting (Millsap, 1979). The critical period would determine whether black hawks would be important constituents of the wildlife resource in the EIS area.

In the long term, zone-tailed hawks would benefit as the number of sites with suitable nesting trees (cottonwoods) increases in riparian areas excluded from grazing.

During migration, great egrets, snowy egrets, and black-crowned night herons would increase their stopover use of stock tanks, areas around Alamo Lake, and parts of Burro Creek and the Big Sandy River. In the long term, the condition of over 97 percent of riparian habitat would improve, and riparian vegetation cover would increase by 50 percent. These State-listed birds may then begin to nest in the EIS area.

In the long term, Gilbert's skink populations would greatly increase as a result of increased litter cover, increased grass and forb height, and an 8 percent increase in plant cover.

The quality of Gila monster habitat would improve, primarily due to increases in prey base. In the long term, prey would increase as a result of a 10 percent increase in plant cover, increased litter, and a 25 percent increase in grass and forb height.

The Sonoran mountain kingsnake population would increase in proportion to its prey base. The kingsnake's prey would increase along with the 13 percent increase in cover and 25 percent increase in low-level cover plant heights in the pinyon-juniper and ponderosa pine vegetation types.

The Hualapai vole would benefit from increases in food and cover plants. Cover would increase by 12 percent, and 40 percent utilization would increase the height of low-level plants. Lower utilization would help maintain the vole's cover requirements and increase the vole population, most likely keeping the species off the State threatened and unique wildlife list.

The ferruginous hawk would continue to winter in the EIS area. It might even breed on Goodwin Mesa due to an improved grassland aspect over 20,000 acres and less livestock-related disturbance of nest sites.

Riparian Habitat

In the long term, the rangeland condition of 98 percent of the riparian habitat would improve from fair and poor to good and excellent. No riparian areas would remain in poor condition. Seedlings of woody riparian plants would flourish. The structural diversity of riparian vegetation would increase greatly, benefitting all wildlife, especially nongame and State-listed species. The Burro Creek drainage would dramatically improve in the long term, as would other riparian areas (Map 2-1). Riparian improvement would even benefit nondependent wildlife using upland habitats (Thomas, Maser, and Rodiek, 1979). The wildlife enhancement al-

ternative would fully meet BLM's objectives on protection or improvement of riparian ecosystems (BLM Manual 6740; Almand and Krohn, 1978).

Management

Grazing treatments under wildlife enhancement would be the same as under the proposed action, except that ephemeral grazing would not occur on desert tortoise crucial habitat. Impacts would be the same as discussed for the proposed action except that desert tortoise and riparian habitats would not be significantly impacted.

Rangeland Developments

Numerous water developments and fences under wildlife enhancement would permanently remove 197 acres of habitat from production.

Waters

Over 140 water developments are proposed for all intensively managed grazing allotments (Table 2-5). Of these, 136 are expected to provide year-round water. With BLM's standard protection around waters, 4,900 acres would deteriorate around the developments because of forage overuse, trampling, and trailing within a 750-foot average radius from the water source (BLM, 1979c).

Increased water availability should be a boon to some wildlife, as water is a primary limiting factor to habitat quality in much of the desert covering 71 percent of the planning area. Some species, however, would be adversely affected because of increased competition.

Water does not limit elk at present, and increased water would significantly impact elk only by reducing spatial competition from cattle.

Additional waters in mule deer habitat would increase individual foraging ranges of deer. Fewer than 30 water developments would significantly extend cattle grazing into previously lightly grazed areas. Areas previously ungrazed by cattle would remain so, since no waters would be placed in such areas. Cover would be reduced in the short term in the intensively managed allotments. The location of water developments would allow deer to forage more in new areas to their overall benefit.

Pronghorn antelope would benefit from waters in new areas if the size of disturbed areas is sufficiently reduced. Additional waters would increase foraging areas for antelope. To avoid impacts to pronghorn, livestock waters would not be placed in crucial pronghorn habitat.

Bighorn sheep would not benefit from additional livestock waters, since none would be located in crucial bighorn habitat.

Increased water availability, however, would benefit javelina by increasing the size of foraging areas.

Waterfowl and shorebirds would benefit directly from each new water development, which would provide additional stopovers during migration. Larger developments would provide wintering and breeding sites.

Upland and small game would benefit from additional waters with surrounding exclosures because the protected areas, disturbed areas, and surrounding habitat would create edges or ecotones (Leopold, 1933), which could provide unique sources of food and cover (Dick-Peddie, 1976; Thomas and others, 1978).

Of the more than 300 nongame species in the EIS area, no more than 30 species of birds and mammals would benefit from additional livestock waters (Elder 1953; Wright, 1959). Nongame habitat in the disturbed areas would not be as severely impacted as under the proposed action, since 20 percent fewer livestock would use the range.

Protected and sensitive wildlife would not greatly benefit from new waters. The bald eagle, peregrine falcon, and Bell's vireo would not be affected, and waters would not be developed in desert tortoise crucial habitat, relieving the potential adverse impact of concentrating livestock grazing on tortoises.

Additional water developments would not significantly impact other protected or sensitive wildlife, except for the Hualapai vole and the Sonoran mountain kingsnake. Cattle concentration at each water in the 6,000 acres of vole and kingsnake habitat would destroy at least 35 acres of vole and kingsnake habitat. Fewer than three new waters are projected, however, and the overall quality of the surrounding habitat is expected to improve greatly.

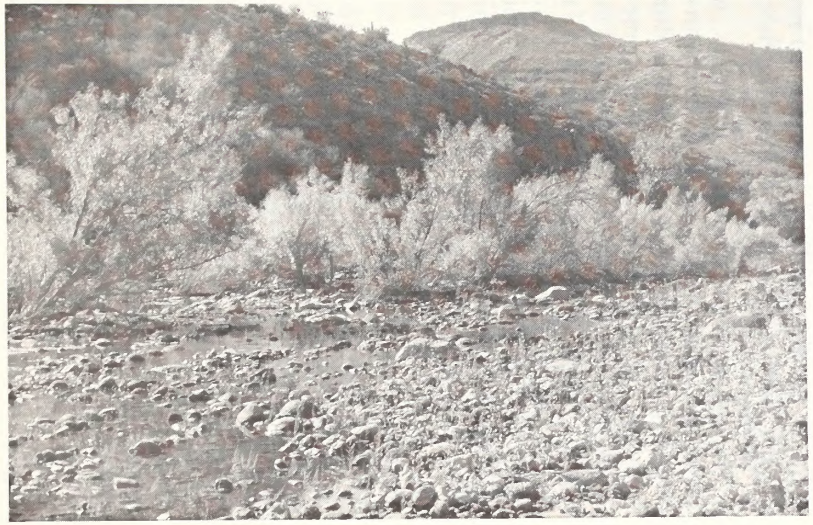
Riparian habitat would not be impacted by additional waters under this alternative.

Fences

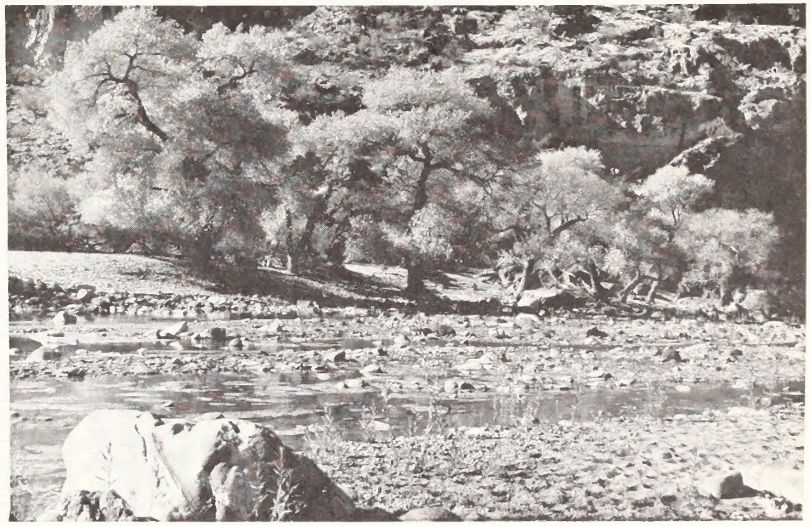
Fencing would extend through 28 allotments for 279 miles, permanently disturbing 28 acres of habitat. Fencing would have negligible impacts on all but biggame and riparian habitat.

Fences would not be constructed in crucial elk habitat (Map 2-3), and no impacts would occur in present elk range. In the long term, however, fences would present some barriers to elk expanding their range into recovering habitat.

Under livestock enhancement 50 percent less fencing would be installed in upland high-density deer habi-



Younger trees are maturing and will replace older trees in background. Wildlife habitat quality is good.



Heavy use by grazing animals prevents seedlings from maturing. As old cottonwood trees in the middle ground die off, none will replace them. Wildlife habitat quality is poor.

Broadleaf Tree Reproduction Is Important to Riparian Habitat Quality

Riparian areas are important to wildlife as well as to livestock and burros. The quality of riparian wildlife habitat in the EIS area is based on the condition of streamside vegetation, particularly broadleaf trees. If overgrazing of young seedlings prevents the replacement of old trees that die off, then habitat will deteriorate and eventually may be lost. Habitat quality is best where seedlings are allowed to mature and replace aging trees.

ECONOMIC AND SOCIAL CONDITIONS

Economic Conditions

Ranch Budgets

Over a 30-year period ranches of all three sizes would be financially better off under present grazing management than under wildlife enhancement.

Small Ranches. Under wildlife enhancement the typical small ranch would undergo a short-term herd reduction of 54 percent from 67 to 31 head. Vegetation increases, however, would allow the ranch to stock a projected herd of 43 head after 20 years, a 39 percent increase over the short-term reduction. Annual net revenue would decline from $2,215 to $683, but increases in vegetation, calf crops, and calf weights would raise net revenue to $2,295 after 20 years. The present value of the 30 years of net revenue for the typical small ranch under present management amounts to $23,582, whereas such revenues under the wildlife enhancement alternative amount to $18,055 (Table 4-14).

Medium-Size Ranch. The typical medium-size ranch would undergo a 57 percent reduction in herd size from 212 to 91 head. Vegetation increases after 20 years, however, are expected to allow for a herd size of 129 head, a 42 percent increase over the short-term reduction. Annual net revenue on the typical medium-size ranch is expected to decrease from $10,567 to $3,369 but increase to $8,958 after 20 years. The present value of 30 years of net revenues on the typical medium-size ranch under present grazing management amounts to $115,647, whereas such revenues under the wildlife enhancement alternative amount to $74,860.

Large Ranch. The typical large ranch would undergo a 48 percent reduction from 788 to 409 head, but vegetation increases would allow for a herd size of 553 cows after 20 years, a 35 percent increase over the short-term reduction. Annual net revenue is expected to decrease from $18,435 to $5,460 but after 20 years to increase to $25,849. The present value of 30 years of net revenues on the typical large ranch under present management amounts to $250,050, whereas such revenues under the wildlife enhancement alternative amount to $189,423.

Ranch Finance

Ranch market values on the typical small ranch would decrease from $131,625 to $46,500, but forage production, calf crop, and calf weight increases would raise ranch values to $77,400 after 20 years. On the medium-size ranch, values would temporarily decrease from $412,500 to $136,500 but after 20 years would increase to $232,200. On the typical large ranch, values would temporarily decrease from $1,394,750 to $613,500 but in the long term increase to $995,400.

Regional Economics

Total gross receipts from the sale of livestock for the 30 ranchers would decrease from $1,279,540 to $637,980 in the short term, reducing the rancher's contribution to Mohave County's livestock sales from 5.1 percent to 2.6 percent. In 20 years ranch receipts would increase to $1,069,490, amounting to 4.3 percent of the county's 1978 total livestock sales. Ranch operating expenses would decrease from $967,370 to $542,860 but increase to $698,470 after 20 years. Ranch labor requirements would decrease from 47.77 to 19.32 workyears in the short term and increase to 33.87 workyears after 20 years. Net revenues for the 30 ranches would decrease from $312,170 to $95,120 in the short term, but would gradually increase to $371,020 in 20 years.

Earnings from ranch employment would decrease from $459,637 or 1.5 percent of the county's total agricultural earnings to $185,858 or 0.6 percent of the county's total. After 20 years, however, earnings from the planning area's livestock industry are expected to rise to $325,829 or 1.1 percent of the county's total.

Construction Income

Estimated earnings from the construction of rangeland developments—$284,120 per year for 5 years—would add 2 percent to the 1977 construction earnings in Mohave County.

Recreation Earnings

Annual recreation use in the planning area would increase by 24,327 visitor days after 20 years, increasing recreation-related expenditures by $486,540. Employment from these expenditures would amount to 12.48 workyears and would add $104,793 of direct income to the county's economy.

Benefit-Cost Analysis

A benefit-cost analysis was conducted for 28 of the 45 grazing allotments in the EIS area. Of the 17 allotments not analyzed, 4 are proposed for ephemeral grazing, 1 is proposed for elimination of livestock grazing, and 12 are not proposed for rangeland developments.

The overall benefit-cost ratio for the rangeland developments under the wildlife enhancement alternative amounted to 1.12:1. This ratio is only useful in comparing the total benefits and costs involved in each alternative. On an allotment-by-allotment basis, developments proposed for 2 of the allotments were found to have benefit-cost ratios greater than 2:1; developments proposed for 9 allotments were found to have benefit-cost

ratios between 1:1 and 2:1; and developments proposed for 16 allotments were found to have benefit-cost ratios below 1:1.

Social Attitudes and Values

Social perceptions and attitudes of Mohave County residents are not expected to be measurably impacted as a result of a decision to implement the wildlife enhancement alternative.

SUMMARY

If implemented, the wildlife enhancement alternative would meet all or portions of 9 of the 10 objectives listed in Chapter 1. It would meet objectives for improving rangeland condition, reducing soil erosion and sedimentation, improving the water quality of the two major watershed areas, improving and protecting wildlife habitat on public lands, improving riparian communities along major drainages, preserving and improving protected plant and animal habitat, and protecting areas of special scenic and cultural values. In the long term, livestock operations would stabilize, although short-term disruptions would be high. Available forage would increase as under the proposed action, but constraints on allocation would not permit reaching the objective of 59,339 AUMs in 20 years.

IMPACTS OF ELIMINATION OF LIVESTOCK GRAZING

VEGETATION

Usable Forage Production

Under elimination of livestock grazing, vegetation currently grazed by livestock would be allowed to complete growth cycles without livestock grazing pressure. Plant vigor would improve soon after livestock are removed, since usually 1 or 2 years of rest are adequate to restore plant vigor (Hormay, 1970). The vegetation would then begin to move toward climax. Partial or complete protection from grazing on deteriorated rangeland releases the vegetation from disclimax status, and secondary succession follows (Tueller, 1973). An exception might occur where a climax species could not successfully compete with a dominant subclimax overstory. In these situations improvement, if any, would be slow.

Production would be higher on protected sites than on continuously grazed areas (Pieper, 1968; Costello and Turner, 1941). In areas not used by burros, production would increase faster than in other areas. Production would increase rapidly during the short term but stagnate and degrade to varying degrees during the long term on highly responsive sites. Usable forage would increase from 116 to 124 pounds per acre. Desirable forage plants would produce more seedlings and become reestablished in the plant community (Table 4-1). Usable forage production would increase the most in the grassland vegetation type (157 to 195 pounds per acre), which has abundant desirable forage plants. The paloverde (96 pounds per acre) and ponderosa pine (41 pounds per acre) vegetation types would not change.

Construction of fences to prevent livestock trespass on public lands would temporarily disturb 756 acres of vegetation and cause a long-term loss of 156 acres of vegetation.

Plant Cover

Plant cover would increase from 22 to 23 percent as plants become more vigorous and reproduction of forage species increases. As desirable species cover increases, the cover of less desirable species would decrease, since composition changes often involve replacement rather than accumulations of plants. Litter would also increase, since plant materials normally consumed by livestock would be left to accumulate. The greatest change in cover would occur in the grassland vegetation type (18 to 20 percent), and the smallest change would occur in the chaparral type (44 to 45 percent) (Table 4-2).

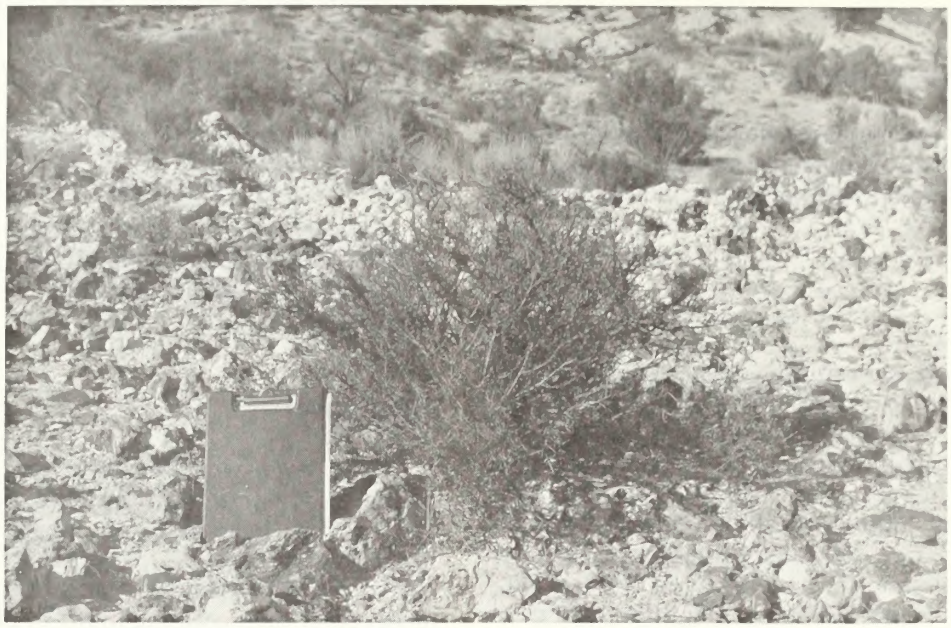
Rangeland Condition

The EIS area's rangeland condition would change as follows: areas in excellent condition would increase from 20,724 to 181,625 acres; areas in good condition would decrease from 280,791 to 155,938 acres; areas in fair condition would decrease from 466,231 to 430,215 acres; and areas in poor condition would decrease from 89,003 to 88,971 acres. Projected rangeland condition by vegetation type is shown in Table 4-3 and by allotment in Appendix 4-1.

Average key species composition would increase from 22 to 30 percent on the 160,901 acres improving from good to excellent condition. As rangeland condition improves from fair to good, key species composition would increase from 15 to 22 percent. As rangeland condition improves from poor to fair, key species composition would increase from 8 to 15 percent (Table 4-3). Key species composition on poor condition rangeland would remain at 8 percent.

Riparian Vegetation

Eliminating livestock grazing would generally improve riparian vegetation even though riparian areas would continue to be grazed by wild burros and wildlife.



Managers Consider Protection for Rare Plants

A rare cliffrose, *Cowania subintegra* is under review by the U.S. Fish and Wildlife Service for designation as an endangered species. This browse plant, preferred by grazing animals, is apparently not producing seedlings. Four of the alternatives analyzed in this EIS would benefit this rare species.

Vigorous growths of cottonwood, willow, mesquite, and saltcedar would be restored to almost all streambanks as well as an understory of herbaceous grasses and forbs. Fencing of livestock from riparian zones appears to be the only certain way to assure protection of the area (Moore and others, 1979).

Usable forage production in riparian areas would increase from 165 to 212 pounds per acre. Cover would increase from 26 to 39 percent. Rangeland condition acreage would improve as follows: excellent from 0 to 163 acres; good from 37 to 4,431 acres; fair from 1,862 to 210 acres; and poor from 2,905 to 0 acres. Percent key species composition would increase as condition classes improve.

Protected Plants

Eliminating livestock grazing would increase the vigor and cover of protected plants as well as the chances for seedling establishment. Onsite field examinations before construction of rangeland developments would assure that endangered, threatened, or sensitive plants are protected.

SOILS

Erosion

Of the alternatives addressed in this study, eliminating livestock grazing on public lands would benefit soils the most. Eliminating livestock would reduce soil compaction, increase total ground cover, and increase water infiltration and retention. Soil erosion would decrease.

The 9,384 acres in critical-severe erosion condition and 97,523 acres in a moderate erosion condition would begin significant improvement over the next 20 years. These projections are based on studies conducted by the Science and Education Administration, USDA, at the Walnut Gulch Experiment Station in southeastern Arizona (Arizona Inter-Agency Range Committee, 1972). In riparian areas, soils now in moderate to critical erosion condition would also significantly improve in the long term due to deceased grazing pressure from livestock and wild burros. See Table 4-5, Impacts on Soils.

Eliminating livestock grazing would benefit all the soils in the EIS area, but finer textured soils, such as the

Springerville, Cabezon and Thunderbird (soil association 12—Grassland soils) would improve the most.

Construction of rangeland developments would temporarily disturb 756 acres of soil and permanently occupy 156 acres. The plants and soils disturbed would need an estimated 3- to 10-year period to recover (BLM, 1978b). The major impact to the soil would be the 156 acres permanently lost to rangeland developments, but this acreage is insignificant compared to the total EIS area. During the construction and recovery period, soil compaction and the removal of ground cover would increase erosion potential. But as vegetation and litter increase, soil erosion would decline. The short-term and long-term impacts—increased soil erosion and decreased ground cover—would be insignificant when compared to the total soil erosion in the EIS area. See Table 4-6, Soil Impacts—Rangeland Developments.

Sediment Yield

Under elimination of livestock grazing, the increase in ground cover and decrease in livestock grazing and upland erosion would be greater than under other alternatives. The weighted average sediment yield would decline by 0.03 acre-feet/square mile/year over the EIS area and would be lower than under any other alternative (Table 4-7).

WATER RESOURCES

Water Quantity

Available surface water supplies would be increased by the water previously consumed by livestock and by abandoned upstream diversions and spring developments. The amount of water gained by elimination of livestock, however, would not be significant to the water resources over the area. Consumption of water would decrease by 30 acre-feet to 9 acre-feet.

Runoff would decrease as infiltration rates are allowed to recover to ungrazed conditions (Gifford and Hawkins, 1978). Flood peaks might be reduced by the increased infiltration and reduced runoff and because of the increased ability of the soil to retain water.

The elimination of ground water consumption would slightly increase water supplies to local aquifers but not enough to affect the area's water resources.

Water Quality

Fecal coliform counts might decrease after the elimination of livestock. Increased wildlife and burro use, however, might provide new sources of fecal coliform. The significance of livestock removal in this case is unknown.

Sediment would decrease with the decrease of grazing-animal concentration in riparian zones. This decrease in sediment might be significant to both water quality and to the hydrology of the streams in heavily grazed areas. Reduced sediment loads change the energy balance of streams and therefore their potential to erode banks and beds (Moore and others, 1979).

As livestock contact with streams declines, nutrients in streams would decrease.

Eliminating livestock grazing would not affect the quality of ground water.

WILDLIFE

This section analyzes the impacts of eliminating livestock grazing on wildlife, primarily with respect to the effect of vegetation changes on wildlife habitat. Table 4-20 rates impacts of this alternative on wildlife and wildlife habitat.

Grazing Adjustments

This alternative would eliminate livestock grazing and maintain wild burro populations at 1981 levels (69 percent of the range's carrying capacity) on allotments with burro herd units (Map 3-1).

In the long term, forage production in elk habitat would increase by 4 percent, mostly on perennial grasses and forbs. In the short term, production resulting from increased vigor of individual plants would greatly increase. Over 1,700 acres would improve from fair to good range condition. Without competition from cattle and with the small increase in forage production, the elk population would increase. Forage would be available for a minimum of 26 elk, an increase of 62 percent over the present number (Table 4-9).

The forage productivity of mule deer habitat would increase by 7 percent. Allotments with the largest increases would be Boriana, Burro Creek, Fancher Mountain, Francis Creek, Los Molinos, Walnut Creek, and Byner. Forage production would increase greatly in the short term but taper off in the long term. Mule deer would have to compete for forage and space only in the 13 allotments inhabited by burros (Map 3-1). Range and habitat condition would improve from fair to poor and from good to excellent on over 160,000 acres in the EIS area. Increased forage would support an additional 697 deer on public lands.

Forage production on pronghorn antelope habitat would increase by 10 percent in the long term, and the short-term change would be dramatic in the pronghorn's grassland habitat. Plant cover would increase by 11 percent, nearly doubling the height of grasses and forbs. The food and cover limiting factors would be greatly alleviated for pronghorns. In the long term, pro-

TABLE 4-20
WILDLIFE AND HABITAT IMPACT RATINGS UNDER ELIMINATION OF LIVESTOCK GRAZING[1]

Alternative's Features	Big Game					Special Status Species		Upland and Small Game	Nongame Wildlife	Riparian Habitats
	Mule Deer	Elk	Bighorn Sheep	Pronghorn Antelope	Javelina	Federal-Listed Threatened/ Endangered Species	Other Protected Species[2]			
Grazing Use										
Vegetation Production Available Initially	4	4	4	5	3	3	3	3	3	4
Vegetation Production Available in 5 years	5	4	4	5	4	4	4	4	4	5
Vegetation Production Available in 20 years	4	5	4	4	3	4	5	4	5	5
Levels of Grazing Management										
Intensive	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Less Intensive	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nonintensive	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ephemeral	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Management Facilities										
Water Developments	4	4	4	4	3	3	4	3	4	NA
Fencing	2	2	3	2	3	NA	NA	4	4	NA
Totals (Average)	3.8	3.8	3.8	4.0	3.2	3.4	3.8	3.6	4.0	4.7
	Average Rating for Alternative 3.8					Average Rating for Existing Situation 2.5				

[1] The rating system is as follows: 1 = most significant downward trend; 2 = downward trend; 3 = relatively static; 4 = upward trend, 5 = most significant upward trend; NA = not applicable.
[2] Proposed threatened or endangered species, State-listed species, BLM sensitive species.

duction would become more stable as perennials and more forbs replace annual grasses.

In the long term, increased forage would allow an increase of at least 14 pronghorn, amounting to a 17 percent increase on public lands.

Desert bighorn sheep habitat would increase in forage productivity by only 1 percent in the long term due to the slow responsiveness of range sites in the Bateman Spring and Artillery Range allotments. Over 1,000 acres would improve in rangeland condition, ending the present downward trend. Although production would not greatly increase, bighorn sheep would no longer compete with cattle for forage or space, and bighorn would extend their range into the foothills and adjacent mountains. Forage would increase enough to support a bighorn population at least 58 percent larger than at present.

Javelina would continue to expand their range and numbers in the short and long term, free of significant competition for food or cover. Increased forage would support at least 1,214 javelina.

Plant cover around waters and riparian habitats would increase by 50 percent, greatly benefitting waterfowl and shorebirds. Many more species would linger in the EIS area during the year, and some might remain to breed.

Upland and small game would benefit from eliminating livestock grazing. Quail cover and forage would increase by at least 6 percent, and populations would fluctuate less than at present. Band-tailed pigeon habitat would increase 6 percent in forage productivity in the long term, and band-tails would benefit from an increase in mast and berry-producing shrubs. As riparian habitat regenerates in the long term, cover in white-winged dove habitat would increase greatly with a corresponding marked increase in white-wing numbers. Mourning dove populations, however, would not noticeably rise.

Desert cottontail and jackrabbit populations would slightly increase over the long term, primarily due to the 6 percent increase in plant cover over the EIS area.

Nongame habitat would improve significantly under the elimination of livestock grazing. The 7 percent increase in forage production, 6 percent increase in plant cover, and increased height and cover of unused grasses and forbs would combine to relieve the short-term and long-term lack of low-level vegetation required by most nongame wildlife. Nongame habitat in riparian areas would greatly improve in the short and long term, although the best habitat quality would occur in the long term as different size classes of riparian trees develop.

Eliminating livestock grazing would improve protected and sensitive wildlife habitat. The productivity of the bald eagle's aquatic and riparian habitat would increase. In addition, roost trees and prey populations would increase in the long term to the point where bald eagles might breed in the upper Bill Williams drainage.

Potential peregrine falcon habitat would improve due to increased prey populations of the riparian drainages along parts of Burro Creek and the Santa Maria and lower Big Sandy Rivers. In the long term, the potential habitat would be more likely to support breeding peregrines.

In desert tortoise habitat, forage productivity would increase by 5 percent, and competition for winter-spring annuals would be nearly eliminated. In the long term, desert tortoise populations would increase or stabilize at 50 per square mile.

Improved habitat condition would increase Bell's vireo habitat in the EIS area from 37 acres at two sites to over 4,500 acres.

In the long term, black hawk populations might increase with improved riparian and aquatic habitat condition. Even with complete protection from grazing, however, a period would occur when not enough trees suitable for nesting would be regenerating to replace the declining overmature trees in the Burro Creek drainage. This critical period would occur in the long term, determining whether black hawks would be important constituents of the wildlife resource in the EIS area.

Zone-tailed hawks would benefit in the long term as the numbers of sites with suitable nesting trees (cottonwoods) increase.

Great egrets, snowy egrets, and black-crowned night herons would increase their use of stock tanks, areas around Alamo Lake, and parts of Burro Creek and the Big Sandy River as stopovers during migration. In the long term, the cover of adjacent riparian vegetation would increase by 50 percent, and over 97 percent of riparian areas would improve in rangeland condition. These State-listed birds might then begin to nest in the EIS area.

Gilbert's skink populations would greatly increase with increased plant and litter cover. The skink would increase its habitat by about 17 percent from the present area of 155,000 acres.

The Gila monster habitat condition would improve, primarily due to increase in prey, litter, and a 4 percent increase in live plant cover.

The Sonoran mountain kingsnake population would increase as its prey base increases, and its prey base would increase with a long-term 4 percent increase in live plant cover.

The Hualapai vole population would increase as its limiting factors—food and cover—increase. Plant cover and height in the lower levels of vegetation would increase by at least 3 and 100 percent, respectively. The

vole would probably not become State-listed in the long term under this alternative.

The ferruginous hawk would probably begin breeding on Goodwin and Bozarth Mesas in the short term and increase in the long term with decreased human and livestock disturbance.

Riparian Habitat

In the long term, the rangeland condition of riparian habitat would improve by over 98 percent (from poor and fair to good and excellent), and no land would remain in poor condition. Woody riparian plants would flourish (Moore and others, 1979). The structural diversity of riparian vegetation would increase, greatly benefitting all wildlife, especially nongame and State-listed species. In the long term, the Burro Creek drainage would dramatically improve, as would other riparian areas (Map 2-1). Riparian improvement would enhance even nondependent wildlife using the upland habitats (Thomas, Maser, and Rodiek, 1979). The elimination of livestock grazing would fully meet BLM's objectives for protection or improvement of riparian ecosystems (BLM Manual 6740; Almand and Krohn, 1978).

Management

Livestock management would be limited to trespass actions only, and have no measurable, adverse impacts to wildlife.

Rangeland Developments

Additional waters would be developed only under wildlife habitat management plans and wild burro herd management area plans. Existing water developments important to wildlife would be maintained with no adverse impact to wildlife habitat.

The 1,500 miles of new fencing required to exclude livestock from public lands would have significant adverse impacts on big game in many allotments. Fences would impede elk movement by crossing elk habitat on the perimeter of nearly every other square mile. Mule deer habitat would be heavily transected by fences in the Happy Jack Wash, La Cienega, Chicken Springs, Greenwood Peak, Francis Creek, Yellow Pine, and Kent's Cane Spring allotments. The number of deer deaths due to entanglement in fences would rise significantly, even with protective features built into the fences. By blocking traditional pathways, fences would also force deer to change their movement patterns. Fencing would heavily crisscross pronghorn antelope habitat in Francis Creek allotment, causing increased death and restricted movements in the short and long term.

Fencing would not severely impact bighorn sheep, since most habitat is on solidly blocked public land. Javelina also would not be significantly affected.

Fire

Eliminating livestock grazing would increase wildfire frequency by increasing fuel production by 14 percent. If allowed to burn significant acreages, wildfire in the pinyon-juniper, grassland, chaparral, and desert shrub vegetation types would result in an increased production of forage and cover, especially forbs and browse. Wildfires would also speed up beneficial habitat changes in chaparral and grassland vegetation types, improving their rangeland condition (Stoddart and Smith, 1955). Improved rangeland condition in these vegetation types would benefit mule deer, pronghorn antelope, Gilbert's skinks, Gila monsters, golden eagles, prairie falcons, merlins, and zone-tailed, sharp-shinned, Cooper's, and ferruginous hawks (BLM, 1980a;b).

WILD BURROS

To bring burro herd numbers in line with their vegetation allocation, 360 burros would have to be removed through a live capture program. Less time would be required for capture than under the proposed action because 344 fewer animals would have to be removed. The period of time the remaining burro herd is exposed to roundup operations would also be less. The captured animals, however, would be exposed to the same level of stress as those under the proposed action. At a 17 percent annual increase, 82 burros would have to be removed annually to maintain the burro population at an average of 483 head.

Under this alternative, livestock would no longer compete with wild burros for vegetation, cover, or water, and burro ranges could be established for the public's viewing without imposing economic hardships on livestock operators.

LIVESTOCK GRAZING

Adjustments in Livestock Numbers

Livestock grazing on public rangelands would be phased out over a 3-year period, and 56,000 AUMs of livestock forage and an undetermined amount of ephemeral forage would be annually lost to the EIS area's livestock industry. Livestock production would decline by over 4,700 head of cattle.

Ranching Operations

Ranching operations would be drastically altered. All operators depend somewhat on Federal lands for

their operations, since privately owned or leased lands are usually inadequate to meet present or future needs. Livestock operations on the 15 nonintensive allotments with little public land would generally suffer low impacts. On the other hand, 25 ranches dependent on the remaining allotments with higher percentages of public lands would be sharply impacted, being forced to reduce herd sizes or seek other sources of forage.

To maintain current levels of operations, highly impacted ranchers would have to buy or lease additional private or State-administered grazing lands, placing increased pressure on already limited and overburdened resources. Some ranchers might consolidate non-Federal lands into economical grazing units. An undetermined number of other operators would be unable to continue ranching and be forced to sell out or cease livestock grazing altogether.

Ranches continuing to operate would face difficult management constraints. A highly intermingled and checkerboard land ownership pattern would limit alternatives for grazing management and require frequent movement of livestock, often by vehicle, from one small pasture to the next. In addition, large investments would be required to develop waters on isolated tracts to make them suitable for grazing.

VISUAL RESOURCES

Vegetation increases resulting from elimination of livestock grazing could change the color and texture of the landscape. Any change would be gradual and most evident along roads. Although contrast ratings would be completed, fence development would still cause visual contrasts. Of the four basic VRM elements (form, color, texture, line), contrast would be greatest due to line, since the 1,500 miles of fencing would have to follow legal boundaries, and some would therefore be skylined. For criteria and methodology, see BLM Manual 8400.

CULTURAL RESOURCES

The elimination of livestock grazing would greatly reduce the impacts of grazing management on cultural resources (Table 4-11). Site deterioration from livestock trampling and rangeland development construction would be eliminated, and erosion would decrease. The construction of 1,500 miles of fence in previously remote areas might increase isolated occurrences of vandalism. In general, however, the decrease in grazing-related uses and travel in the EIS area would decrease vandalism.

RECREATION

Eliminating livestock grazing would impact hunting, ORV use, and recreation sightseeing. Increases in small and upland game could cause an undetermined increase in hunter use visitor days. Big-game populations are projected to increase by 2,923 animals, increasing big-game hunting by 18,112 visitor days per year. Any increase in game would also increase opportunities for viewing wildlife. The 1,500 miles of proposed fencing would decrease ORV cross-country opportunities by an undetermined amount. See Table 4-13.

WILDERNESS VALUES

On EIS area lands proposed as wilderness study areas, all rangeland management activities will comply with BLM's *Interim Management Policy and Guidelines for Lands under Wilderness Review* (BLM, 1979b). No impacts on wilderness values are expected.

ECONOMIC AND SOCIAL CONDITIONS

Economic Conditions

Ranch Budgets

Over a 30-year period ranches of all three sizes would be financially better off under present grazing management than under elimination of livestock grazing.

Small Ranch. Eliminating livestock grazing from public lands in the EIS area would reduce the herd size of the typical small ranch by 81 percent from 67 to 13 head. Annual net revenue (gross revenue minus cash costs) would fall from $2,215 to $88.

The present value of the typical small ranch's net revenue over a 30-year period under present grazing management amounts to $23,582, whereas such revenues under elimination of livestock grazing amount to $1,078 (Table 4-14). Although small ranchers have outside income to supplement ranch income, the herd reduction would probably put some ranchers out of business. Others would probably maintain a small herd on private and State lands.

Medium-Size Ranch. The herd size on the typical medium-size ranch would be reduced by 76 percent from 212 to 50 head, and annual net revenue would decrease from $10,567 to $1,703. The present value of the medium-size ranch's net revenue over a 30-year period under present grazing management amounts to $115,647, whereas such revenues under elimination of livestock grazing amount to $20,862.

Since many ranchers in the medium-size class support themselves and their families solely from their ranch operations, this alternative would force them to seek outside income.

Large Ranch. The herd size on the typical large ranch would decrease by 60 percent from 788 to 317

head. Annual net revenue would decrease from $18,435 to $2,486. The present value of the rancher's net revenue over a 30-year period under present grazing management amounts to $250,050, whereas such revenues under elimination of livestock grazing amount to $30,463. This reduction would probably force many of the large ranchers out of business.

In summary, the severe reductions under this alternative would probably cause all of the medium and large size ranches to either consolidate into an economic unit or break into many small ranches and find outside employment.

Ranch Finance

Eliminating livestock grazing on public land would hinder the rancher's ability to borrow both operating and long-term capital. The value of the ranches would decrease, reducing the value of the rancher's assets to the point that most bankers would be reluctant to loan long-term capital. BLM economists calculated that the market value of the typical small ranch would drop from $131,625 to $22,500, the market value of the typical medium-size ranch would drop from $412,500 to $75,000, and the market value of the typical large ranch would drop from $1,394,750 to $475,500.

Ranch net revenues would greatly decline under this alternative, also impairing the rancher's ability to borrow operating capital and repay loans.

Regional Economics

Total gross receipts from the sale of livestock for the 30 ranchers in the EIS area would decrease by 64 percent from $1,279,540 to $459,790, reducing the contribution to Mohave County's yearly livestock sales from 5.1 to 1.9 percent.

Expenditures by EIS area ranchers for their operating expenses would decrease from $967,370 to $417,020—a reduction of 57 percent. Net revenues would decrease from $312,170 to $42,770.

The EIS area's annual ranch labor requirements would drop from 47.77 to 11.60 workyears. Earnings from this ranch employment would decrease from $459,637 to $111,590, reducing Mohave County's total agricultural earnings by $348,047 or 1.2 percent.

Construction Income

The construction of rangeland developments—$675,000 per year for 5 years—would add 5 percent to the county's total 1977 construction earnings of $14,178,000.

Recreation Income

Recreation use in the EIS area would increase by 18,112 visitor days, increasing recreation-related expenditures by $362,240. Employment from these additional recreation expenditures would amount to 9.3 workyears, which would add $78,021 in related earnings to the economy of Mohave County.

Benefit-Cost Analysis

Because of a lack of quantifiable information on the benefits expected under the elimination of livestock grazing alternative, a benefit-cost analysis was not conducted.

Social Attitudes and Values

Social perceptions and attitudes of Mohave County residents are not expected to be measurably impacted as a result of a decision to implement the elimination of livestock grazing alternative.

SUMMARY

Eliminating livestock grazing would meet 7 of the 10 objectives listed in Chapter 1. It would reduce erosion and sedimentation, improve water quality in the two major watershed areas, maintain viable herds of wild burros, improve habitat for wildlife, protect and improve riparian communities along major drainages, preserve habitat for sensitive plants and animals, and protect special natural, scenic, recreational, and cultural values. Rangeland condition would improve but not to the level established in the objectives. This alternative would not meet the objectives of stabilizing livestock operations and increasing available forage to 59,339 AUMs in 20 years.

ENERGY CONSERVATION

No detailed analysis was completed on which alternative would be most efficient in conserving energy. We believe, however, that energy use is not a major issue since relatively little fuel would be needed to implement any proposal.

Energy would be consumed primarily in operating vehicles and equipment for monitoring and studies, management operations, and the construction and maintenance of rangeland developments. The construction of rangeland developments under the proposed action, wildlife enhancement, and elimination of livestock grazing would require the largest short-term consumption of fuel, whereas the alternatives would differ little

in energy use for monitoring and studies. Intensive management practices under the proposed action and wildlife enhancement would require greater energy use than other alternatives due to management operations.

None of the alternatives offer many opportunities for conserving energy. Gasohol or an equivalent fuel could be substituted for gasoline in vehicles and equipment. Wind-driven pumps might be installed at well sites instead of electricity-powered or gasoline-fueled pumps. Travel by foot or horseback might be substituted for vehicle travel during inspections, maintenance, monitoring, and studies.

MITIGATING MEASURES

Measures that BLM has determined to be necessary to protect or enhance resource conditions under any of the alternatives have been described in Chapter 2. This section presents additional mitigating measures that BLM managers may select during decisionmaking[1] to reduce impacts or enhance resource management, but which may be

1) inconsistent with present BLM policies or regulations;

2) constrained by current funding or personnel levels;

3) encumbered with additional resource conflicts;

4) of undetermined technical feasibility or benefit-cost ratio;

5) dependent upon future studies or the development of management activity plans.

Measures that lie outside the jurisdiction of BLM but that might be employed to reduce impacts have also been included.

1. Vegetation

• Rangeland productivity under nonintensive grazing management is projected to deteriorate over a 20-year period. Private operators running livestock on nonintensive allotments could develop ranch plans in cooperation with the SCS, BLM, the Arizona State Land Department, the Arizona Range Task Force, universities, and other local, State, or Federal agencies. Ranch plans could incorporate management systems that would restore rangeland productivity and provide for multiple-use benefits.

2. Livestock Grazing

• Proposed reductions in livestock grazing would economically hurt many grazing permitees and jeopardize at least a few operations. To lessen the impact, reductions could be phased over a 5-year period, with an initial reduction made on the effective date of the decision and the balance made in the third and fifth years. The decision could be amended if monitoring shows rangeland conditions are not improving at a satisfactory rate or that they are responding faster than anticipated. In such cases the amended decision would specify revised adjustments to be taken by the end of the 5-year period.

• Many livestock operators in the EIS area have acquired years of valuable rangeland management experience and want to improve the long-term productivity of public, State, and private rangelands within their ranches. The Kingman Resource Area could implement an expanded experimental stewardship program to test new ideas that encourage individual operators to change management or make investments to improve rangeland conditions. The program would be implemented in accordance with provisions of the Public Rangelands Improvement Act. Given success with initial projects and broadened authority, the program could be opened to wider participation from cooperating permittees.

• Many of BLM's rangeland management decisions are made under pressure to implement management programs in the absence of adequate data on short-term and long-term plant and animal responses for specific areas and in the face of limited or conflicting research. Through its Arizona State Office, Phoenix District, and Kingman Resource Area, BLM could expand efforts to consult at length with livestock operators, State and Federal agencies, universities, the Arizona Range Task Force, and other interested parties before issuing decisions and during the formulation of AMPs. Inventory data, rangeland studies, planning recommendations, and proposed decisions could be reviewed and the rangeland program adjusted where warranted by new or additional information. BLM's coordination would continue indefinitely to ensure thorough evaluation of programs and the development of satisfactory procedures to resolve specific rangeland management problems.

• Suspension of current grazing preference and lowered incomes from reduced livestock sales would adversely affect the ability of some ranchers to borrow cash for operating expenses. New or existing programs could provide low-interest or federally-backed loans to such operators in cooperation with agencies, such as the Farmers Home Administration and the Agricultural Stabilization and Conservation Service. Such loans would ease the impact until current levels of income and grazing preference are restored.

3. Wildlife

• Livestock compete with game and nongame species for food and cover throughout the EIS area. Although the broad impacts are generally understood,

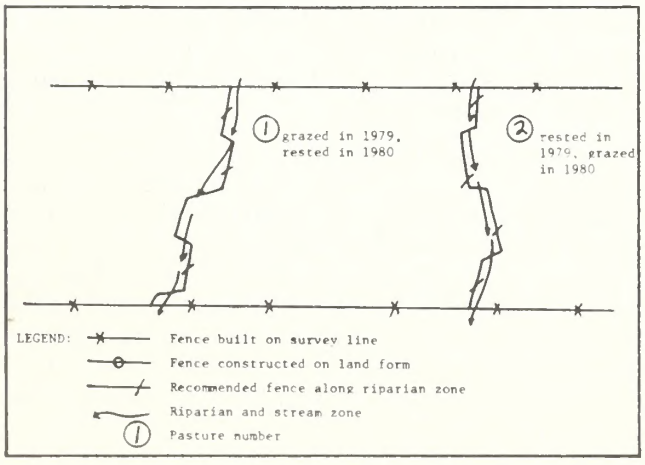
[1] Selection of these measures would depend on appropriate changes in policy or regulation, adequate funding, future determination of technical feasibility, favorable benefit-cost ratios, or consistency with management plans and objectives.

inadequate data exist on discrete relationships and site-specific problems. Using information from exclosures and fecal analyses, BLM could analyze specific AMPs to identify relationships and critical problem areas. Results of the studies would provide the area manager with data needed to mitigate the effects of livestock grazing on wildlife and reduce competition by adjusting AMPs.

• Livestock-bighorn sheep competition for forage inhibits expansion of bighorn into their historic and potential habitat. In cooperation with AG&FD, BLM could determine the distribution and extent of bighorn use. Areas of conflict would be identified and fenced to exclude livestock. Likely conflicts between livestock and bighorn sheep could also be determined in potential bighorn habitat. Fencing or other measures could then be undertaken before introducing bighorn sheep into such areas.

• Disturbed areas around water developments create unsatisfactory conditions for some wildlife species. BLM could study the effects of livestock overgrazing on wildlife food and cover around waters and develop and implement management guidelines to reduce the size and impact of these areas.

• Overgrazing in the EIS area's riparian zones impairs important wildlife habitat. When practical, pastures on intensively managed allotments could be designed to route fences along lengths of riparian habitat as shown in the diagram below. Fences would cross the riparian zone at even intervals so that periods of rest in each pasture would rest portions of the riparian habitat. Implementation of this design feature would ensure that entire riparian areas are never grazed at one time. This method alone, however, would not provide for significant riparian recovery, since recovery requires specified rest beneficial to riparian species.



Recommended arrangement of allotment or pasture boundaries based on the location of the riparian zone. Reproduced from Busby (1979) with permission of Trout Unlimited.

• Yearlong grazing in riparian habitats has adversely impacted riparian reproduction, vigor, and condition. To improve plant response and to restore the quality of wildlife habitat, BLM could design intensive grazing systems to rest riparian habitats from May 1 through September 30 in two out of three growing seasons (based on Martin, 1973; 1979).

• Overgrazing in riparian zones in the EIS area has adversely affected important wildlife habitat, but excluding livestock grazing in riparian areas would adversely affect livestock operations. When practical, livestock grazing in riparian habitats could be managed separately from grazing on the uplands by creating riparian pastures. The season and intensity of livestock use in riparian areas could thus be controlled, and important riparian plant species could be managed as key species (from Behnke and Raleigh, 1978).

• Livestock management developments (windmills, troughs, salting stations, corrals) often occur in riparian zones, leading to a marked disturbance of the habitat. Existing and future livestock management developments could be relocated at least 2 miles away into the uplands, decreasing pressures on the riparian zones.

• Fencing of elk habitat can disturb movement patterns and result in entanglement and death. Forest Service fence specifications could be used in crucial elk habitat, or wooden planks or stays could be stapled to the top wire at documented crossing sites, giving the animals a better reference point for jumping and lessening the chance of entanglement (Ferrell, 1980).

UNAVOIDABLE ADVERSE IMPACTS

Unavoidable adverse impacts are the adverse impacts of the proposed action that would not be mitigated. Such impacts are often referred to as "residual" impacts. They are unavoidable mainly because either (1) the proposed action directly conflicts with other values or (2) the cost of mitigation would be prohibitively high.

• New rangeland developments would permanently disturb 228 acres of soil and vegetation.

• At the 158 proposed water developments sediment yield would increase slightly.

• Unfenced spring and riparian habitats accessible to livestock would remain in unsatisfactory condition.

• During the construction of water developments, wildlife would be temporarily disrupted. Water developments would permanently disturb 54 acres of habitat. Moreover, concentrated livestock grazing around 158 new water developments would maintain 5,600 acres of habitat in unsatisfactory condition.

• The construction of 266 miles of new fence would restrict big-game movement, increasing the potential for big game (particularly mule deer) to die of entanglement in fences.

• Livestock would continue to compete with wildlife until grazing systems or adjustments are implemented. During this time, two-thirds of the EIS area would remain under current conditions.

• The initial reductions in livestock AUMs would have the following short-term and long-term adverse impacts on livestock operations:

Short Term:	Reduce grazing preference by 40,175 AUMs
Long Term:	Reduce grazing preference by 28,252 AUMs
Short Term:	Reduce present 5-year average licensed use by 21,454 AUMs
Long Term:	Reduce present 5-year average licensed use by 9,531 AUMs

• The additional time and labor involved in maintaining rangeland developments and in moving livestock to implement grazing systems would increase costs to livestock operators.

• Visual resources would be adversely impacted by the placement of rangeland developments.

• Subsurface cultural resources not discovered in initial surface surveys could be damaged or destroyed during construction or as a result of trespass or unauthorized construction. In addition, vandalism could occur at cultural resource sites.

• A short-term loss in net revenue would decline in the short term, and ranch values would decrease in the long term.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

This section identifies the irreversible and irretrievable commitments of resources resulting from the proposed action. The term "irreversible" refers to what is incapable of being reversed: once something is initiated, it would continue. The term "irretrievable" means irrecoverable: once something is used, it is not replaceable.

• Construction of rangeland developments would result in the loss of 228 acres occupied by the facilities. Forage removed from protection would be irretrievable, amounting to 33 AUMs annually for the life of the proposed projects. Soil disturbance would result in a small and unquantifiable loss of soil.

• Decreased livestock sales resulting from lower initial stocking rates represent an irretrievable loss to livestock operators.

• Proposed livestock grazing and rangeland developments could disturb certain cultural resources, either directly or indirectly through vandalism. The irretrievable loss of historical and archaeological sites for future study would deplete or alter the nonrenewable cultural resource base and could result in a gap in the history of the area. The mitigation of impacts by salvage—surface collection or excavation rather than avoidance—would also lead to an irretrievable commitment of the resource.

RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

During the period of implementation (1982–1987), BLM proposes a number of actions affecting the short-term use of the public rangelands in the EIS area. Principal elements of the proposal include adjusting current livestock and wild burro numbers, allocating vegetation to consumptive uses (the first allocation ever made to wildlife and wild burros in the area), implementing intensive grazing management systems, and constructing rangeland developments. The purposes of these actions are to bring grazing in line with estimated carrying capacity of the public rangelands, make better use of rangeland resources, protect critical resources, increase rangeland productivity, and provide for greater multiple-use benefits in the rangeland management program.

Twenty years after the proposals are fully implemented, rangeland productivity would benefit significantly. Favorable impacts include increased vigor and production of key plant species, improved rangeland condition, less erosion and sedimentation, greater plant cover, greater water infiltration, and improved water quality. Wildlife habitat would generally improve throughout the EIS area, and big-game populations would increase by 20 to 25 percent. Stable and viable herds of wild burros would be maintained and livestock operations stabilized at a satisfactory level of production.

APPENDICES

CHAINFRUIT CHOLLA

APPENDIX 1-1
VEGETATION METHODOLOGY AND RANGELAND INVENTORY CRITERIA

Projection of Usable Forage Production Increases and Future Rangeland Condition

Potential usable forage production within a 20-year timeframe for all alternatives was determined for each vegetation type under poor, fair, good, and excellent rangeland conditions from vegetation inventory data. Data gaps were filled by extrapolating from similar types and by using data from technical range site guides.

Rangeland condition was projected by vegetation type using the following criteria: 1) current rangeland condition; 2) apparent trend; 3) range site; 4) potential for response; 5) proposed management and use; 6) soils, and 7) precipitation.

Acres of changed condition classes were multiplied by pounds of usable forage production to determine projected usable forage production. Usable forage production was determined for each vegetation type and allotment for all alternatives.

Determining Usable Forage Production

The Phoenix District completed a rangeland survey of the Hualapai-Aquarius Planning Area from 1978-79, using BLM's rangeland inventory method for mapping and the SCS estimate-by-weight-unit method for sampling and determining production. The rangeland survey, however, established initial stocking rates only. Survey data were determined as accurately as possible, but nature is variable. Monitoring studies must be implemented to evaluate management programs over time and to provide the basis for future adjustments.

BLM resource specialists used recent natural-color aerial photographs, topographic maps, soil survey information, and a helicopter to map preliminary range sites or complexes of range sites. SCS provided technical range site guides for the planning area, and the Arizona State Land Department inventoried State lands concurrently, using the range site concept.

The preliminary map of range sites was then verified in the field and further subdivided by condition class and vegetation type. The mappable unit was called a site writeup area (SWA). The SWA may be a homogeneous unit (strata) or a complex of strata. Strata consist of a range site with the same condition class and vegetation type within an allotment. Key parameters such as vegetation species, production data, and apparent trend were assessed on a strata basis within each allotment and documented on field writeup sheets (Figure A-1).

Once strata were determined, rangeland specialists visited each strata, noting vegetation species, estimating total vegetation production and percent composition by weight, and determining apparent trend and current erosion conditions. The ability to estimate vegetation production and percent composition was enhanced by estimating data by plots and verifying the data by clipping the current year's growth, air drying, and then weighing. The survey team also trained by completing double sampling of plots (estimating all plots and clipping to adjust the data) on relict areas (good to excellent rangeland condition). During the survey the team met once a week to estimate and clip plots to keep current and ensure uniformity among team members.

Vegetation production was adjusted to air-dry weight, normal year, full production from guides provided by SCS and refined by BLM during the field survey.

This procedure was completed on all strata in each planning area allotment. Data gathered in this process include (1) total annual vegetation production (ephemeral and perennial), (2) percent species composition by weight, (3) phenology of key species, (4) rangeland suitability for cattle, (5) rangeland condition and apparent trend, (6) soil surface factor (erosion), (7) potential vegetation production (by using range sites), (8) soil classification, and (9) location and condition of rangeland developments.

Range Suitability

BLM uses four major criteria to determine whether an area is suitable for livesotck grazing and can be credited to the overall forage supply for allocation. Each allotment was examined, and the following factors (to the extent applicable) were considered.

Slope - areas with a slope exceeding 50 percent were found unsuitable for livestock grazing. Although forage may exist, livestock normally graze the more accessible slopes before grazing steeper slopes.

Distance from Water - areas more than 3 miles from water on fairly level terrain and somewhat less than 3 miles on steeper terrain will normally not be grazed until the forage nearer to water is exhausted. Thus, if the objective is to keep these areas from being damaged, the forage value of more distant areas cannot be credited since these areas will be used only after areas closer to water have been overgrazed.

Low Forage Production - areas producing less than 25 pounds of forage per acre, particularly when intermingled with higher producing areas, will normally not be grazed until the higher producing sites have been exhausted. These areas were determined unsuitable.

Highly Erodable Areas - Grazing would heavily damage areas where the erosion or soil surface factor (SSF) is 60 or above, further accelerating erosion and making areas unsultable for livestock use.

Rangeland specialists mapped suitability (slope and distance from water) during the range survey, using the following suitability classes and codes for livestock:

a. Suitable (SU)--water, slope, production, and erosion meet the criteria.

b. Potentially suitable (PPF)--forage production is less than 25 pounds per acre, but water, slope, and erosion meet the criteria.

c. Potentially suitable (PW)--area exceeds distance-to-water criteria, but slope, and erosion meet the criteria.

d. Potentially suitable (PP)--area exceeds distance-to-water criteria, and forage production is less than 25 pounds per acre. Slope and erosion, however, meet the criteria.

e. Unsuitable (US)--slope exceeds 50 percent, but forage production is greater than 25 pounds per acre.

f. Unsuitable (UP)--slope exceeds 50 percent, and forage production is less than 25 pounds per acre.

Annuals

Since annual (ephemeral) vegetation production fluctuates widely with annual precipitation and growing season conditions, BLM used the following approach to project forage production increases. A multi-disciplinary team used SCS technical range site guides to allocate the safe amount of annuals that can normally be depended upon during the growing seasons. The guides show plant species composition by weight and the potential plant community if the site is in excellent ecological condition. The guides also show the vegetation production of the site during favorable, normal, and unfavorable years. The percent of annuals allowed in excellent condition during the unfavorable years was considered in allocation. For example, if the guide showed 400 pounds of total vegetation produced in unfavorable years and 10 percent annuals were allowed in excellent condition, 40 pounds (400 x .10) were considered in the allocation. A sufficiently low proper use factor (10 percent) was assigned to annuals to assure that no more than the allowable use is made of the key species.

Allowable and Proper Use Factors

Allowable use factors (AUFs) and proper use factors (PUFs) were assigned to each species grazable by livestock, wildlife, or burros on a yearlong basis. An AUF represents the percent of the annual growth of a plant species that could be removed and still allow the species to regenerate itself. The AUFs determine the forage pool for the computer allocation model. A PUF represents the percent of annual growth of a plant species that an animal would prefer to eat if the rest of the rangeland is not overgrazed.

Forage Requirements

Forage allocations to wildlife were based on the following monthly forage requirements.

Antelope	160 pounds
Burro	400 pounds
Cattle	800 pounds
Deer	200 pounds
Elk	670 pounds
Horses	1,000 pounds
Javelina	97 pounds
Bighorn Sheep	154 pounds
Domestic Sheep	160 pounds

Linkage to Site Writeup Areas (SWAs)

Each grazing animal in the planning area was linked to the appropriate site writeup area (SWA) by allotment where grazing occurs or would occur. This linkage would limit allocation only to SWAs where the animal would be grazing.

Determination of Rangland Condition and Apparent Trend[1]

Rangeland Condition - The rangeland condition of areas within a range site was determined by comparing the present plant community to the climax plant community, as indicated by the technical guide for the site. For the existing plant community specialists counted no more than the maximum weight (or percentage of total production) shown on the guide for any species in the climax plant community.

The amount of all climax species not in excess of that shown on the guide was totaled to show the relative ecological rating or numerical evaluation of the stand. The rating will range from 0 to 100, depending on how closely the plant community resembles the climax plant community for the range site.

The following four classes were used to express the degree to which the present plant community composition reflects climax composition.

Range Condition Class	Percentage of Present Plant Community that is Climax for the Range Site
Excellent	76-100
Good	51-75
Fair	26-50
Poor	0-25

Guides based on the weight of species in the climax plant community truly express ecological condition. A condition rating based on the percentage of composition alone may be adjusted if the total production is less than that characteristic for the condition class. For example, a rating determined by counting the percentage of each climax species may show that the existing plant community is in near-climax condition but that the production of these species is less than expected for near-climax condition. The condition rating can then be lowered, considering current growing conditions.

Apparent Trend - The present ecological rangeland condition rating alone does not tell whether the plant community is improving or deteriorating in relation to its potential. Trend is a separate means necessary for assessing what is happening to the plant community. Existing rangeland condition results from a sustained trend over time. Trend should be known when planning the use, management, and treatment needed to maintain or improve rangeland. The following vegetation and soil characteristics, indicating apparent trend in rangeland condition, were evaluated in the field during the rangeland survey: plant composition; seedling and young plant abundance; plant residues; plant vigor; and solid surface factors such a bare ground, soil crusting, stone cover, compaction, plant hummocking, and soil movement.

[1] Soil Conservation Service, 1976c.

FIGURE A-1

RANGE SITE INVENTORY SHEET

ALLOTMENT NAME BAGDAD ALLOTMENT NUMBER 0005

TECHNICIAN ANDERSEN DATE 11/2/78 STRATA SYMBOL K

STRATA IDENTIFICATION 40-3 (High) (MLRA) Granitic Hills (RANGE SITE) Good (RANGE COND.) 0466 (VEGETATION TYPE) (Relevant Type)

SWA NUMBERS K18 ACRES WITHIN STRATA

SOIL SERIES MOANO (458) - ROCK OUTCROP (5%) COMPLEX (GR-L)

ELEVATION 3000 SLOPE 7-15% EXPOSURE MIXED

LOCATION - T 14 N R 11 W, SECTIONS 3 & 2 G & SRM

TOPOGRAPHIC QUADRANGLE KAISER SP SE AIR PHOTO NUMBER 36-10, 37-10

ORTHO PHOTO QUAD NAME & NUMBER

TREND

KEY FORAGE PLANTS	VIGOR			REPRODUCTION			PHENOLOGICAL STAGE			
	HIGH	MED.	LOW	ABUNDANT	SOME	NONE	START GROWTH	FLOWERING	SEED RIPE	DORMANT
BOER4	X				X				X	
STSP3	X				X					X
BOGU		X			X		X			

LITTER: ABUNDANT | X SOME | NONE

GULLY-RILL STABILIZATION: COMPLETE | X SOME | NONE

TREND RATING: UP | X STATIC | DOWN

EROSION CONDITION CLASS

SSF → | STABLE | 22 SLIGHT | MODERATE | CRITICAL | SEVERE | ← SSF

0 20 40 60 80 100

RANGELAND CONDITION

VEGETATION CONDITION CLASS: 0 POOR | 25 FAIR | 50 54 GOOD | 75 EXCELLENT 100

FINAL CONDITION CLASS: POOR | FAIR | X GOOD | EXCELLENT

EXPLANATORY NOTES Schist soils usualy Loamier Than Granitic Soils - Have Slightly less potential

RANGE SUITABILITY ADJUSTMENTS

BRUSH — %
ROCK — %
*SLOPE — %
*FORAGE PRODUCTION — %
*WATER — %
*EROSION (SSF) — %
*TO BE COMPLETED AFTER APPLYING RANGE SUITABILITY GUIDELINES AND SUBSEQUENT TO MFP ALLOCATIONS OF ANNUAL HERBAGE PRODUCTION

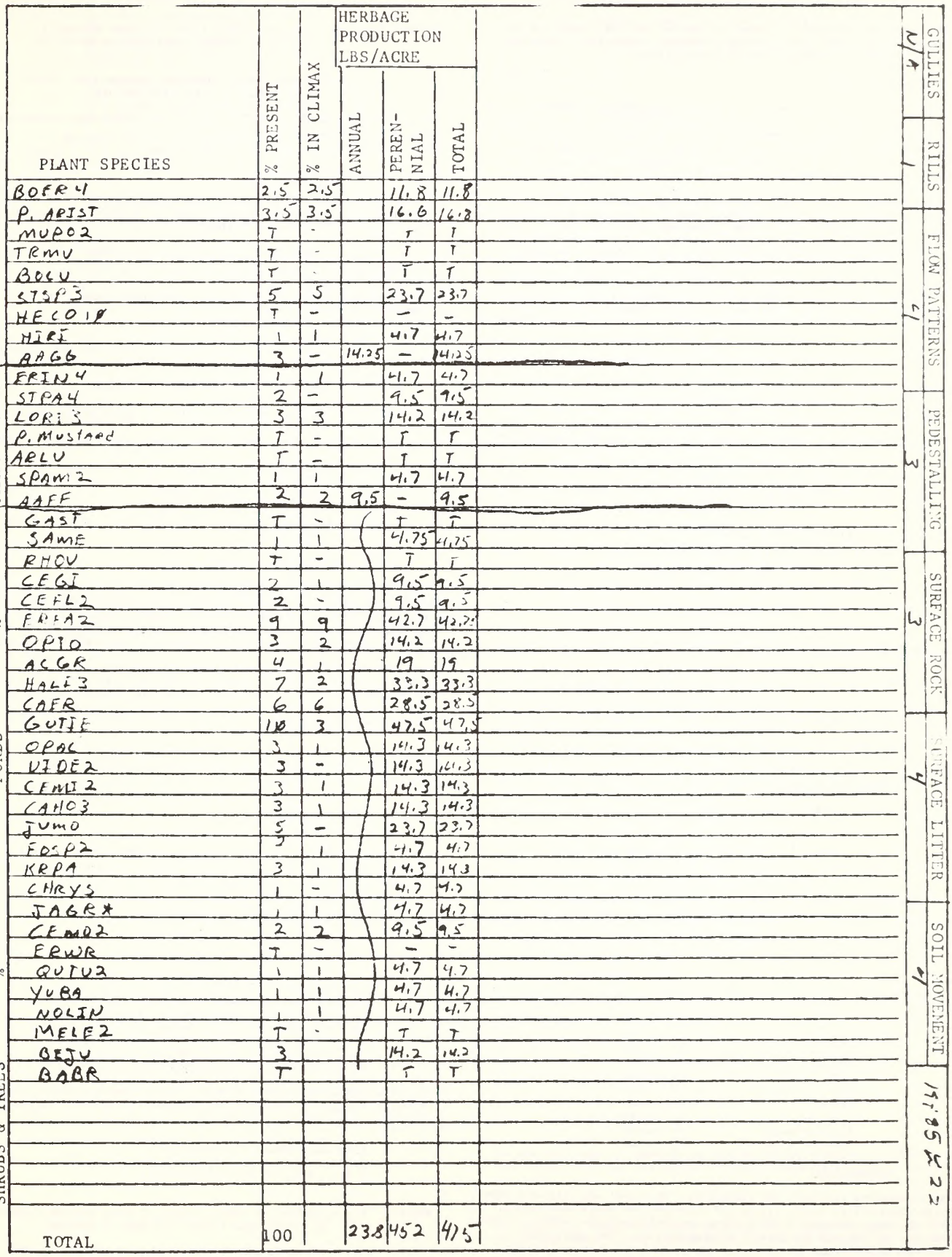
FORAGE ALLOCATION

TOTAL ANNUAL HERBAGE PRODUCTION 475 LBS/AC
*USABLE BY LIVESTOCK @ P.G.U. — LBS/AC
*LESS ALLOCATION FOR OTHER USES — LBS/AC
*ADJUSTED — LBS/AC
*GRAZING CAPACITY — AC/AUM

REMARKS

Schist P.M. Soils more Loamy Than Granitic Hills. Potential would be slightly less.

FIGURE A-1 (Continued)



PLANT SPECIES	% PRESENT	% IN CLIMAX	HERBAGE PRODUCTION LBS/ACRE ANNUAL	PERENNIAL	TOTAL
BOER4	2.5	2.5		11.8	11.8
P. ARIST	3.5	3.5		16.6	16.8
MUPO2	T	-		T	T
TRMU	T	-		T	T
BOGU	T	-		T	T
STSP3	5	5		23.7	23.7
HECO10	T	-		-	-
HIRI	1	1		4.7	4.7
AAGG	3	-	14.25	-	14.25
ERIN4	1	1		4.7	4.7
STPA4	2	-		9.5	9.5
LORI3	3	3		14.2	14.2
P. Mustard	T	-		T	T
ARLU	T	-		T	T
SPAM2	1	1		4.7	4.7
AAFF	2	2	9.5	-	9.5
GAST	T	-		T	T
SAME	1	1		4.75	4.75
RHOV	T	-		T	T
CEGI	2	1		9.5	9.5
CEFL2	2	-		9.5	9.5
FEID2	9	9		42.7	42.7
OPIO	3	2		14.2	14.2
ACGR	4	1		19	19
HALI3	7	2		33.3	33.3
CAER	6	6		28.5	28.5
GUTI2	10	3		47.5	47.5
OPAC	3	1		14.3	14.3
VIDE2	3	-		14.3	14.3
CEMI2	3	1		14.3	14.3
CAHO3	3	1		14.3	14.3
JUMO	5	-		23.7	23.7
EOSP2	1	1		4.7	4.7
KRPA	3	1		14.3	14.3
CHRYS	1	-		4.7	4.7
JAGR*	1	1		4.7	4.7
CEMO2	2	2		9.5	9.5
ERWR	T	-		-	-
QUTU2	1	1		4.7	4.7
YUBA	1	1		4.7	4.7
NOLIN	1	1		4.7	4.7
MELE2	T	-		T	T
BEJU	3			14.2	14.2
BABR	T			T	T
TOTAL	100		23.8	452	415

GRASS & GRASS LIKE %

FORBS %

SHRUBS & TREES %

DETERMINATION OF EROSION CONDITION CLASS

GULLIES	RILLS	FLOW PATTERNS	PEDESTALLING	SURFACE ROCK	SURFACE LITTER	SOIL MOVEMENT	COMPUTATION/SSF
N/A	1	4	3	3	4	4	15.05 X 22

APPENDIX 1-2
METHODOLOGY FOR ALLOCATING VEGETATION TO LIVESTOCK, WILDLIFE, AND WILD BURROS

Vegetation was allocated to competing ungulate grazing animals in the Hualapai-Aquarius EIS area by using a computer vegetation allocation model developed by the BLM's Denver Service Center.

1.0 ALLOCATION MODEL

The vegetation allocation model is a linear programming (LP) model. The basis of an LP model is an objective function and a set of constraints. The objective function is something that is maximized (or minimized, depending upon the problem). The set of constraints restricts the objective function. As the term linear programming suggests, all relationships are assumed to be linear.

A detailed explanation of the vegetation allocation model exists as a technical paper: A Linear Programming Model for Vegetation Allocation to Herbivores Using PUFs and AUFs (Martinson and MacPherson, 1979). This paper is available through the Denver Service Center, Division of Data Base Administration, Branch of User Design (D212), Denver, Colorado 80225.

The vegetation allocation model seeks to maximize the use of forage for grazing, subject to the constraints of animal forage preference (PUF), plant maintenance (AUF), diet, animal numbers, equality, and management.

The following is the formulation of the basic model:

Objective Function

$$\text{Max} \sum_{ik} \sum r_i \, m_{ik} \, x_{ik} \qquad 1.1$$

SWA Level Constraints (subscript k dropped for clarity of presentation)

$$f_{ij} \leq PUF_{ij} \text{ for each plant } j \text{ and animal } i \qquad 1.2.1$$

$$f_{ij} \, V_j S_i \leq (1+DRF)(RPV_{ij}) \, r_i \, m_i \, x_i \text{ for each plant } j \text{ and animal } i \qquad 1.2.2$$

$$f_{ij} \, V_j S_i \geq (1-DRF)(RPV_{ij}) \, r_i \, m_i \, x_i \text{ for each plant } j \text{ and animal } i \qquad 1.2.2$$

$$x_i = \frac{1}{m_i \, r_i} \sum_j f_{ij} \, V_j \, S_i \text{ for each animal } i \qquad 1.2.3$$

$$\sum_i f_{ij} \leq AUF_j \text{ for each plant } j \qquad 1.2.4$$

Allotment Level Constraints

$$X_i = \sum_k x_{ik} \text{ for each animal } i \qquad 1.2.5$$

$$X_i \leq U_i \text{ for each animal } i \qquad 1.2.5$$

$$X_i \geq L_i \text{ for each animal } i \qquad 1.2.5$$

1.1 Objective Function

$$\text{Max} \sum_{ik} \sum r_i \, m_{ik} \, x_{ik}$$

where: x_{ik} = number of animals of type i in SWA k
m_{ik} = number of months that animal type i is present in SWA k
r_i = pounds of forage required per month by animal type i

i.e., Maximize the pounds of forage consumed by all animals in an allotment. This can be illustrated using the units of measure.

pounds/animal-month (r_i) x months (m_{ik}) x animals (x_{ik}) = pounds

Monthly forage requirements used for the Hualapai-Aquarius EIS are as follows:

Antelope	160 pounds
Burro	400 pounds
Cattle	800 pounds
Deer	200 pounds
Elk	670 pounds
Horses	1,000 pounds
Javelina	97 pounds
Bighorn Sheep	154 pounds
Domestic Sheep	160 pounds

1.2 Constraints

The constraints fall into two categories: SWA level and allotment level. Constraints 1.2.1, 1.2.2, 1.2.3, and 1.2.4 are SWA level constraints. In each of these constraints the k subscript could have been added to each item but was omitted for clarity of presentation. The management constraints described in part 1.2.5 are operational on the allotment level.

1.2.1 Animal Forage Preference - Proper Use

$$f_{ij} \leq PUF_{ij} \text{ for each plant } j \text{ and animal } i$$

where: f_{ij} = fraction of annual growth of plant species j consumed by animal type i over m_i months of grazing

PUF_{ij} = proper use factor of plant species j by animal type i for m_i months of use.

i.e., the fraction of a plant consumed by an animal type cannot exceed that animal's preference for that plant.

1.2.2 Dietary Constraints

Dietary constraints require each animal to consume a complete diet and enable the decisionmaker to place a range of acceptable values on the diet preference estimates as follows:

$$f_{ij} \, V_j S_i \leq (1+DRF)(RPV_{ij}) \, r_i \, m_i \, x_i \text{ for each plant } j \text{ and animal } i$$

$$f_{ij} \, V_j S_i \geq (1-DRF)(RPV_{ij}) \, r_i \, m_i \, x_i \text{ for each plant } j \text{ and animal } i$$

where: f_{ij} = fraction of annual growth of plant species j consumed by animal type i over m_i months of grazing

V_j = pounds of annual production of plant species j

S_i = fraction of land suitable for grazing by animal type i

r_i = pounds of forage required per month by animal type i

m_i = number of months animal type i is present

X_i = number of animals of type i

RPV_{ij} = relative preference value for plant species j* by animal type i

DRF = dietary range factor

i.e., The pounds of a plant an animal consumes must be approximately the pounds that animal prefers. The relative preference value (percent in diet) is allowed to vary within certain limits, the value of which is specified by the dietary range factor. For example, the RPV of BØGR2 is 0.25 $\pm$ (0.10 x 0.25). That is, it ranges from 0.225 to 0.275.

Note that suitability affects the model by reducing the pounds of annual production for a SWA by the percent of the SWA that is unsuitable for a particular animal type. Also the "limited suitability" and "potentially suitable" classifications do not enter the model. These two categories are considered unsuitable.

*RPVs that result from dietary studies may be entered directly or the model will calculate them using PUFs as follows:

$$RPV_{ij} = \frac{PUF_{ij} \text{ for each plant } j \text{ and animal } i}{\sum_j PUF_{ij}}$$

i.e., Since PUFs are a readily available source of dietary preference estimates, they are used to estimate relative preference values (percent in diet).

1.2.3 Animal Numbers Equality Constraint

$$x_i = \frac{i}{m_i \, r_i} \sum_i f_{ij} V_j S_i \text{ for each animal } i$$

where: x_i = number of animals of type i
m_i = number of months that animal type i is present
r_i = pounds of forage required per month by animal type i
f_{ij} = fraction of annual growth of plant species j consumed by animal type i over m_i months of grazing
V_j = pounds of annual production of plant species j
S_i = fraction of land suitable for grazing by animal type i

i.e., The number of animals is equal to the total pounds of forage consumed, divided by the forage requirement (in pounds per animal-month).

1.2.4 Plant Maintenance - Allowable Use

$$\sum_i f_{ij} \leq AUF_j \text{ for each plant } j$$

where: f_{ij} = fraction of annual growth of plant species j consumed by animal type i over m_i months of grazing

AUF_j = allowable use factor of plant species j

i.e., The total fraction of a plant species consumed by all animals cannot exceed the allowable use of that plant.

1.2.5 Management Constraints

Management constraints enable the decisionmaker to set a minimum and a maximum number of animals at the allotment level as follows:

$$X_i = \sum_k x_{ik} \text{ for each animal } i$$

$$X_i \leq U_i \text{ for each animal } i$$
$$X_i \geq L_i \text{ for each animal } i$$

where: X_i = number of animals of type i in allotment
x_i = number of animals of type i in SWA
U_i = maximum number of animals of type i
L_i = minimum number of animals of type i

i.e., The number of animals in the allotment is equal to the number of animals in all the SWAs and must be less than the upper bound and more than the lower bound.

1.3 Other Characteristics

To satisfy user needs, several options have been provided.

1.3.1 Options to Change Raw Data

The AUF, PUF, seasons of use, and suitability data are present on the input files to allocation. One option allows the user to change AUFs and PUFs at the allotment level. Another option is provided to change AUF, PUF, seasons of use, and suitability data at the SWA level. These changes will affect the SWA submodels. They are temporary changes that do not affect the allotment permanent files. The temporary changes may be saved permanently if desired.

1.3.2 SWA Merging by Common Use and Suitability

Individual SWAs can be merged into larger groups according to common use and suitability.

Suitability information for each animal type on each SWA is accumulated in the following categories:

Percentage Range	Percentage Range
100-91	50-41
90-81	40-31
80-71	30-21
70-61	20-11
60-51	10-0

A scanning procedure finds all SWAs with the same mix of animal types. If each animal type has the same suitability classification in a group of SWAs, a merge is conducted, and the pounds of annual production (V_j) are summed for all SWAs in the group. Thus, only one set of dietary and animal numbers equivalent constraints exists for each group of SWAs. This option reduces markedly the size and processing time of the allocation model.

1.3.3 Sieved Plant Composition

This option involves reducing the number of plant categories in the SWA submodel by examining the percent composition of each plant.

Percent composition by plant is determined as follows:

$$V_j \div \sum_j V_j = C_j \text{ for each plant } j$$

where: V_j = pounds of annual production of plant species j
C_j = percent composition of plant species j is of the forage community

The plant composition sieving routine scans the plants and their percent composition and merges all plants less than a given percent into a miscellaneous category. The critical value is entered externally by the user at the SWA or allotment level. If entered at the allotment level, this value is applied to all SWAs in that allotment.

1.3.4 Sieved Relative Preference Values

This option involves reducing the number of plant categories in the SWA submodel by examining each plant's relative preference value. If the RPV is less than the critical value input externally by the user, that plant is put into a miscellaneous category. If the critical value is entered at the allotment level, it is applied to all SWAs in that allotment.

1.3.5 Composition Weighted Relative Preference Values

Relative preference values will vary depending upon forage availability. RPVs (diets) derived from PUFs (1.2.2 footnote) have been criticized because of this. An option was provided to weight PUFs by the percent composition of each plant in the plant community. This option will alter the calculation of RPVs (1.2.2 footnote) as follows:

$$RPV_{ij} = \frac{PUF_{ij} C_j}{\sum_j PUF_{ij} C_j} \text{ for each plant } j \text{ and animal } i$$

where: RPV_{ij} = relative preference value for plant species j by animal type i

PUF_{ij} = proper use factor of plant species j by animal type i

C_j = percent composition of plant species j

This option also allows the user to weight the relative preference values by the log of the percent composition of each plant in the plant community. This option will alter the calculation of RPVs (1.2.2 footnote) as follows:

$$RPV_{ij} = \frac{PUF_{ij} \log C_j}{\sum_j (PUF_{ij} \log C_j)}$$

where: RPV_{ij} = relative preference value for plant species j by animal type i

PUF_{ij} = proper use factor of plant species j by animal type i

$\log C_j$ = log of the percent composition of plant species j

i.e., The proper use factor of a plant is adjusted according to the abundance of that plant in the plant community for the purpose of computing relative preference values.

Composition weighted RPVs may be entered on the SWA or allotment level. If entered on the allotment level, the same value applies to all SWAs in that allotment.

1.3.6 Percent of Normal Production

The production entering the allocation model has been adjusted to maximum production for the current growing season. It was also adjusted to the "normal" year (via the climatic adjustment factor). Aberration from the normal year's production will cause changes in stocking rates that are of interest to managers and planners. These aberrations from the normal year also result from changing use patterns, climate, and range improvements. The planner may want to know the impact on stocking rates of proposed range improvements or use patterns (assuming the percent of normal production is known). This option alters the production of each plant in the dietary constraints and animal numbers constraints as follows:

$$AV_j = V_j P \text{ for each plant } j$$

where: AV_j = pounds of annual production of plant species j adjusted for difference from normal year

V_j = pounds of annual production of plant species j

P = percent of normal production

The adjusted production (AV_j) is substituted for the original production (V_j) in dietary constraints and animal numbers constraints.

1.3.7 Seasonality

The formulation of the allotment model is based on the seasons entered on data input forms. The model reduces the seasonal data to one period of use by weighting procedures. A weighted average is calculated for AUFs and PUFs on the basis of the number of days in each season that the current period of use represents. AUFs are weighted by the combined season of use of all animal types. PUFs are weighted by animal type for those seasons during which the animal may be present. (Note that RPVs are calculated after PUFs are weighted [1.2.2 footnote]). All other data are input on an annual basis.

2.0 ALLOCATION EXAMPLE

The output of the forage allocation model is presented in sections. The allotment-level information is displayed first. The remaining data are presented SWA-by-SWA. When making batch runs the option is provided to print only allotment-level results. The reader is advised to follow the text with the example.

2.1 Allotment Level Data

The number of animals of each species present in the allotment is listed along with the respective upper and lower bounds. This is the final result of the model calculations.

The total forage consumed is calculated by multiplying the number of animals of each animal species by its monthly forage requirement and by the number of months in the current season of use, and then summing the products for all animal species.

2.2 SWA Level Data

The SWA level data are repeated for each SWA in the allotment. IF SWAs were merged, these data are printed by group of SWAs.

2.2.1 Optimal Animal Mixture

For each animal species the number of animals, the number of months in the current season of use, and the percent of the SWA suitable are displayed. Multiplying the number of animals by the number of months results in animal-months (AM). Dividing SWA acres by the animal-months yields the acres per animal-month.

2.2.2 Proper Use Factors by Animal and Plant Species

The used, unused and given PUFs for each plant and animal are displayed. If no animals are estimated for a particular species, the PUFs are not listed. Given PUFs are those entered on the input form and weighted to the current season of use. (Note that these PUFs are not weighted by percent composition here even if that option is chosen.) Used PUFs are calculated internally by the linear programming model according to the formulae described in part 1.2.1 and 1.2.2. Used PUFs are synonymous with f_{ij} in these formulae.

Since the PUF is a percentage of a plant that could be used by an animal, used or unused PUFs are the actual percentage of the plant production that was or was not used.

Some plants may have the PUF listed as "0," which indicates that no PUF was entered for that plant by that animal. It will have a PUF for one of the other animals in the allotment.

Some plants may have UNUSED PUFs of "-0.00." This is due to internal round-off tolerances and should be considered zero.

2.2.3 Target Relative Preference Values and Computed Diet

The target and computed RPVs are printed for all species with some animals in the SWA. Target RPVs are those calculated in part 1.2.2 (footnote). If the option to weight PUFs was selected, the target RPVs printed here have been weighted. The calculated diet is the diet used by the model in allocating forage to the various animals. It varied from the target RPVs but remains within the limits imposed by the dietary range factor. If the DRF is zero, the target RPVs and the calculated diet are identical.

Some plants have target RPVs of "0," indicating that no PUF was entered for the plant by that animal.

Some plants have target RPVs of "0.00," indicating that the RPVs were rounded to zero when they were calculated. This will occur when a plant with a low PUF is weighted by the percent composition, which is also low.

2.2.4 Allowable Use Factors, Percent Composition, and Total Production by Plant Species

Unused and given AUFs, percent composition by plant, and total plant production are displayed. The percent composition is calculated by dividing the pounds of production of each plant into the total pounds of forage production for the SWA. Given AUFs are those entered on the VU Input Form and weighted to the current season of use. Used AUFs are the sum across all animal species of the used PUFs.

GLOSSARY

ALLOWABLE USE FACTOR (AUF) - The percent of the annual growth of a plant species that could be removed and still allow for the species to regenerate itself.

CALENDAR SEASONS - Spring - 3/21-6/20; Summer - 6/21-9/20; Fall - 9/21-12/20; Winter - 12/21-3/20

COMPUTED DIET - The actual diet computed by the model, which will vary within the imposed dietary range factor constraint, depending upon limited forage supplies. Computed diet is similar in concept to target diet but differs in considering the dietary range factor. Also see target diet.

CONSTRAINTS - In linear programming, a set of one or more algebraic equalities or inequalities that cannot be violated. There may be subsets, e.g. plant maintenance constraints, animal forage preference constraints. As an example, a single constraint may be that cattle will not include more than 20 percent of saltbrush in their diet in fall.

CURRENT SEASON OF USE - The period of the year currently in use; expressed as MM/DD-MM/DD; synonymous with current period of use.

DIETARY RANGE FACTOR (DRF) - A factor allowing the relative preference values in the target diets to vary when forage becomes limiting (plant maintenance constraints, i.e. UNUSED AUF equals zero or animal forage preference constraints, i.e. UNUSED PUF equals zero); the specific value chosen is based on working with the model and user knowledge of the variability in diets.

FORAGE - A plant with a proper use factor greater than zero for any animal on the inventory area.

VEGETATION ALLOCATION - Process by which allowable forage is alloted to the herbivores present.

LIMITING CONSTRAINTS - Those constraints limiting the value of the objective function. Altering the values of these constraints will change the final results.

LINEAR PROGRAMMING - Method for allocating resources among competing activities in an optimal manner; four basic assumptions 1) all relationships are linear, 2) nonnegativity - the value of each activity (nonanimal species) must be greater than or equal to zero, 3) continuity - values can take any nonnegative real number, and 4) all values are known, i.e. they are deterministic.

OBJECTIVE FUNCTION - Establishes the criteria for determining what is optimal in a linear programming problem; an algebraic function to be maximized or minimized.

OPTIMAL - In linear programming, optimal is defined by the objective function; in this case of the forage allocation model, optimal is the largest amount of available forage consumed.

OPTIMIZATION - A general field of data analysis including several different methods for solving problems in an optimal fashion; optimal solutions are sought when a large number of feasible solutions (feasible region) exist, as opposed to the instance where one and only one value satisfies a set of equations, i.e. only one correct answer exists.

PERCENT COMPOSITION - Fraction an individual value is of the whole.

PARAMETER - A variable whose value determines the characteristics of a problem; the value of the parameter may vary between runs but not within a single run.

PERIOD OF USE - The season of the year currently in use; expressed as MM/DD-MM/DD; synonymous with current season of use.

PREFERENCE - Relish with which an animal selects a plant for consumption.

PROPER USE FACTOR - PUF; the percent of the annual growth of a plant species an animal would prefer to eat given the rest of the range is not overgrazed; an estimate of animal forage preference.

RELATIVE PREFERENCE VALUE (RPV) - The proper use factor of a plant by an animal in relation to all other plants in a SWA; calculated by dividing an individual PUF by the sum of the PUFs for all plants in a site writeup area; synonymous with percent in the diet.

SITE WRITEUP AREA - SWA; an area delineated or mapped within a rangesite based on condition or present vegetation.

SUITABILITY - Since all land is not used by all animals, four suitability criteria have been established for land used by livestock: (1) distance from water, (2) percent slope, (3) SSF, and (4) production. Criteria have not yet been established for wildlife species.

TARGET RPVs - Estimated from proper use factors; since proper use factors are an available index of preference, a diet for an animal in a site writeup area is estimated by normalizing the proper use factors of that animal for the plants present in the site writeup area.

TOLERANCE LEVEL - The critical value above or below which a given process will or will not operate, e.g. if the percent composition for a plant is less than the critical value, it will be merged into a miscellaneous category.

```
 EXAMPLE 4 4 Normal Optimal Mix Execution

*SVA/ALLOCATE

SVIM ALLOCATE VERSION 1.1.     EXPIRATION DATE  9/30/80

ALL ALLOCATE USERS,
 BREAK and DISPLAY SVA/CLUE1



ENTER UNIQUE SINGLE CHARACTER IDENTIFIER
=X
(SO)FILE MPSOUTX -- NON-EXISTENT
(SO)FILE BATOUTX -- NON-EXISTENT
(SO)FILE DATAINX -- NON-EXISTENT

DO YOU WANT TO RUN A BATCH OF ALLOTMENTS?
=NO


ENTER NAME OF ALLOTMENT DATA FILE
=EXAMPLE1
DO YOU WANT TO MAKE ANY SWEEPING DATA CHANGES?
=NO


DO YOU WANT TO SEE OR CHANGE ANY OF THE RAW DATA?
=NO
DO YOU WANT TO MERGE SWAS BY COMMON USE AND SUITABILITY?
=NO


DO YOU WANT TO ENTER PARAMETERS AT ALLOTMENT LEVEL?
=YES
DO YOU WANT SIEVED PLANT COMPOSITION?
=YES
ENTER PLANT COMPOSITION TOLERANCE,IN FRACTIONAL FORM
=.01
ENTER COMPOSITION WEIGHTING PREFERENCES FOR RPVS
(UNW)UNWEIGHTED, (LOG)LOG-WEIGHTED, (FUL)FULLY WEIGHTED
=FUL
ENTER DIETARY RANGE FACTOR, IN FRACTIONAL FORM
=.25
ENTER NORMAL YEAR PRODUCTION FACTOR,IN FRACTIONAL FORM
=1.0


SWA ENTRIES
A001
A002
A003


ALLOTMENT ENTRIES
ENTER UPPER AND LOWER BOUNDS FOR CATTLE
=999,0
ENTER UPPER AND LOWER BOUNDS FOR MULE DEER
=999,0
ENTER UPPER AND LOWER BOUNDS FOR ROCKY MT. ELK
=999,0


MATRIX DIMENSIONS   221 BY    96
NO. OF MATRIX ENTRIES=    672

MAIN MEMORY=  56K
NO. OF SCRATCH FILES= 4
NO. OF LINKS PER FILE= 30
TIME LIMIT, IN HUNDREDS OF AN HOUR= 10
  SNUMB # 0703L

0703T - GEIN EXECUTING @ 07.518

0703T - INACCESSIBLE @ 07.519

0703T-01 - WAIT ALOC @ 07.519

0703T-01 - WAIT CORE @ 07.520

0703T-01 - EXECUTING @ 07.521

0703T-01 - TERMINATING @ 07.567

0703T - OUTPUT WAITING @ 07.569
normal termination

JOUT INVOKED FOR 0703T

function?RELE


ALLOTMENT NUMBER 1001-00


OPTIMAL ANIMAL TYPE MIXTURE   NO. ANIMALS    MAX. NO.    MIN. NO.

CATTLE                             18.92        999.          0.
MULE DEER                           6.12        999.          0.
ROCKY MT. ELK                       7.11        999.          0.


TOTAL FORAGE CONSUMED     113320.


SWA NUMBER A001
                          NO. ANIMALS  NO. OF MONTHS   SUITABILITY

CATTLE                          1.51          5.00          0.87
MULE DEER                       3.70         12.03          1.00
ROCKY MT. ELK                   3.68          7.03          1.00

FORAGE CONSUMED      24386.


FOR CATTLE
```

	USED PUFS	UNUSED PUFS	GIVEN PUFS	TARGET RPVS	CALC. DIET
ARARN	0.07	0.05	0.12	0.07	0.09
ARTR2	0.01	0.01	0.02	0.01	0.01
ATCO	0.04	0.07	0.10	0.01	0.01
BOGR2	0.22	0.16	0.37	0.26	0.33
CEMO2	0.12	0.22	0.33	0.13	0.09
CHLE4	0.07	0.05	0.12	0.01	0.01
CHNA2	0.	0.	0.	0.	0.
ELSA	0.07	0.05	0.13	0.08	0.10
ERCO14	0.03	0.03	0.06	0.01	0.02
HIJA	0.14	0.24	0.37	0.03	0.03
JUOS	0.	0.	0.	0.	0.
ORHY	0.15	0.29	0.45	0.06	0.04
PIED	0.02	0.01	0.03	0.06	0.07
STCO4	0.13	0.24	0.37	0.23	0.17
MISC	0.04	0.07	0.11	0.03	0.03

FOR MULE DEER

	USED PUFS	UNUSED PUFS	GIVEN PUFS	TARGET RPVS	CALC. DIET
ARARN	0.23	0.	0.23	0.34	0.35
ARTR2	0.14	0.	0.14	0.11	0.11
ATCO	0.06	0.	0.06	0.01	0.01
BOGR2	0.	0.	0.	0.	0.
CEMO2	0.22	0.03	0.25	0.23	0.21
CHLE4	0.13	0.	0.13	0.03	0.03
CHNA2	0.01	0.	0.01	0.01	0.01
ELSA	0.01	0.	0.01	0.02	0.02
ERCO14	0.04	0.	0.04	0.02	0.02
HIJA	0.06	0.	0.06	0.01	0.01
JUOS	0.03	0.	0.03	0.04	0.04
ORHY	0.04	0.01	0.05	0.02	0.01
PIED	0.01	0.	0.01	0.06	0.07
STCO4	0.03	0.	0.03	0.04	0.04
MISC	0.10	-0.00	0.10	0.07	0.07

FOR ROCKY MT. ELK

	USED PUFS	UNUSED PUFS	GIVEN PUFS	TARGET RPVS	CALC. DIET
ARARN	0.16	0.	0.16	0.12	0.14
ARTR2	0.04	0.	0.04	0.02	0.02
ATCO	0.04	0.	0.04	0.00	0.00
BOGR2	0.17	0.	0.17	0.14	0.16
CEMO2	0.14	0.07	0.21	0.10	0.07
CHLE4	0.13	0.	0.13	0.01	0.02
CHNA2	0.02	0.	0.02	0.00	0.00
ELSA	0.14	0.	0.14	0.11	0.12
ERCO14	0.02	0.	0.02	0.01	0.01
HIJA	0.30	0.	0.30	0.03	0.04
JUOS	0.02	0.	0.02	0.02	0.02
ORHY	0.28	0.15	0.43	0.07	0.05
PIED	0.02	0.	0.02	0.05	0.06
STCO4	0.30	0.09	0.39	0.29	0.25
MISC	0.08	-0.00	0.08	0.03	0.03

FORAGE

	UNUSED AUFS	GIVEN AUFS	PLANT COMP	PLANT PROD
ARARN	0.00	0.45	0.09	10038.
ARTR2	0.26	0.45	0.04	5107.
ATCO	0.34	0.48	0.01	1370.
BOGR2	0.14	0.53	0.10	11196.
CEMO2	0.	0.48	0.05	6046.
CHLE4	0.50	0.83	0.01	1457.
CHNA2	0.44	0.48	0.02	2741.
ELSA	0.25	0.48	0.09	9897.
ERCO14	0.38	0.48	0.03	3393.
HIJA	0.	0.50	0.01	1463.
JUOS	0.55	0.60	0.10	11003.
ORHY	0.	0.48	0.02	2050.
PIED	0.55	0.60	0.29	33004.
STCO4	0.	0.45	0.09	9933.
MISC	0.31	0.52	0.04	5067.

UNUSED FORAGE   35842.

DIETARY RANGE FACTOR   0.25
NORMAL YEAR PRODUCTION FACTOR   1.00

SWA NUMBER A002

	NO. ANIMALS	NO. OF MONTHS	SUITABILITY
CATTLE	2.00	5.00	0.82
MULE DEER	2.42	12.03	1.00
ROCKY MT. ELK	3.42	7.03	1.00

FORAGE CONSUMED   23432.

FOR CATTLE

	USED PUFS	UNUSED PUFS	GIVEN PUFS	TARGET RPVS	CALC. DIET
ARARN	0.09	0.03	0.12	0.07	0.08
ARTR2	0.02	0.01	0.02	0.01	0.01
BOGR2	0.28	0.09	0.37	0.24	0.30
ELSA	0.09	0.03	0.13	0.07	0.09
HIJA	0.28	0.09	0.37	0.03	0.04
ORHY	0.20	0.25	0.45	0.31	0.23
PIED	0.02	0.01	0.03	0.06	0.07
SPCO	0.05	0.02	0.06	0.00	0.00
STCO4	0.18	0.19	0.37	0.21	0.17

FOR MULE DEER

	USED PUFS	UNUSED PUFS	GIVEN PUFS	TARGET RPVS	CALC. DIET
ARARN	0.23	0.	0.23	0.50	0.53
ARTR2	0.14	0.	0.14	0.16	0.17
BOGR2	0.	0.	0.	0.	0.
ELSA	0.01	0.	0.01	0.03	0.03
HIJA	0.04	0.02	0.06	0.02	0.02
ORHY	0.04	0.01	0.05	0.13	0.10
PIED	0.01	0.	0.01	0.10	0.10
SPCO	0.10	0.	0.10	0.01	0.01
STCO4	0.02	0.01	0.03	0.06	0.04

```
FOR ROCKY MT. ELK
          USED PUFS UNUSED PUFS  GIVEN PUFS TARGET RPVS  CALC. DIET

ARARN          0.14         0.02        0.16        0.10        0.13
ARTR2          0.04         0.01        0.04        0.01        0.02
BOGR2          0.15         0.02        0.17        0.12        0.15
ELSA           0.12         0.02        0.14        0.09        0.11
HIJA           0.18         0.12        0.30        0.03        0.02
ORHY           0.24         0.19        0.43        0.34        0.27
PIED           0.02         0.00        0.02        0.05        0.06
SPCO           0.           0.          0.          0.          0.
STCO4          0.25         0.13        0.39        0.25        0.24


FORAGE
          UNUSED AUFS  GIVEN AUFS  PLANT COMP  PLANT PROD

ARARN          0.           0.45        0.11       10038.
ARTR2          0.26         0.45        0.05        5107.
BOGR2          0.10         0.53        0.12       11196.
ELSA           0.24         0.48        0.11        9897.
HIJA           0.           0.50        0.02        1463.
ORHY           0.           0.48        0.13       12050.
PIED           0.55         0.60        0.35       33004.
SPCO           0.33         0.48        0.01         523.
STCO4          0.           0.45        0.11        9933.


UNUSED FORAGE      24938.


DIETARY RANGE FACTOR      0.25
NORMAL YEAR PRODUCTION FACTOR      1.00


SWA NUMBER A003
                          NO. ANIMALS  NO. OF MONTHS   SUITABILITY

CATTLE                          15.41           5.00          1.00

FORAGE CONSUMED      65502.


FOR CATTLE
          USED PUFS UNUSED PUFS  GIVEN PUFS TARGET RPVS  CALC. DIET

AGTR           0.45         0.          0.45        0.03        0.03
ATCO           0.10         0.          0.10        0.02        0.02
BOGR2          0.37         0.          0.37        0.03        0.03
CEMO2          0.21         0.          0.21        0.59        0.59
ELSA           0.13         0.          0.13        0.18        0.18
EPVI           0.14         0.          0.14        0.01        0.01
ERHY3          0.06         0.          0.06        0.00        0.00
GLME           0.36         0.          0.36        0.03        0.03
JUOS           0.           0.          0.          0.          0.
ORHY           0.45         0.          0.45        0.05        0.05
PHHO           0.01         0.          0.01        0.00        0.00
PIED           0.03         0.          0.03        0.02        0.02
MISC           0.07        -0.00        0.07        0.03        0.03

FORAGE
          UNUSED AUFS  GIVEN AUFS  PLANT COMP  PLANT PROD

AGTR           0.05         0.50        0.01        5000.
ATCO           0.37         0.48        0.04       14755.
BOGR2          0.15         0.53        0.01        5000.
CEMO2          0.26         0.48        0.44      181581.
ELSA           0.35         0.48        0.22       92055.
EPVI           0.31         0.45        0.01        5601.
ERHY3          0.42         0.48        0.01        5025.
GLME           0.12         0.48        0.01        5121.
JUOS           0.60         0.60        0.04       17558.
ORHY           0.03         0.48        0.02        7500.
PHHO           0.46         0.48        0.01        4655.
PIED           0.57         0.60        0.10       42502.
MISC           0.46         0.53        0.07       28664.


UNUSED FORAGE      140831.


DIETARY RANGE FACTOR      0.25
NORMAL YEAR PRODUCTION FACTOR      1.00


NOTE: EXAMINE DIET AND MAKE APPROPIATE CHANGES

FILE RELEASED-MPSOUTX


DO YOU WANT ANOTHER RUN?
=NO
*
```

APPENDIX 1-3
HUALAPAI-AQUARIUS EIS SCOPING PROCESS

The Council on Environmental Quality's "Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act" (40 CFR 1500-1508) require Federal agencies to begin an early and open process for determining the scope of issues to be addressed in an environmental impact statement (EIS). Agencies are directed to invite the participation of affected Federal, State, and local agencies and other interested parties in identifying significant issues and alternatives to be addressed in the EIS.

Extensive public participation was invited throughout the development of the Hualapai-Aquarius Land Use Plan and in preparation of the grazing EIS. The following list summarizes the actions taken:

August 1978	Letter to grazing allottees regarding range inventory and planning process.
August 1978	Letter to individuals and organizations on District mailing list announcing the intent to prepare a land use plan and a grazing EIS.
October 1978	Public meeting in Kingman to explain range inventory and land use planning process.
October 1978 through present	Numerous requests for public comment and involvement published in bimonthly District newsletters; at appropriate times, these were accompanied by progress reports.
November 1978	Field trip to explain range inventory process to the interested public.
December 1979	Public workshops to facilitate completion of unit resource analysis (URA), Steps 3 and 4
December 1979	Three days of informal meetings with livestock allottees to gather information for ranch budgets and economic analysis.
January 1980	Public workshops to facilitate completion of management framework plan (MFP) Step 1.
April 1980	Two-day public workshop to facilitate completion of MFP Step 2. Workshop participants represented a wide variety of backgrounds and special interests.
May 1980	Notice of Intent to prepare an EIS published in Federal Register with call for public comments on issues and alternatives.
June 1980	News release distributed to local media inviting public participation in scoping meetings.
June 1980	Public meetings and open houses were held in Phoenix, Prescott, and Kingman to present MFP Step 2 recommendations and to identify significant issues and alternatives to be addressed in the grazing EIS.

In addition, BLM personnel met numerous times in the field with ranchers during the rangeland inventory. Representatives of the Soil Conservation Service, the Arizona State Land Department, and the Arizona Game and Fish Department were consulted during the inventories to check resource data, coordinate methodologies, and exchange information. Consultation with the Fish and Wildlife Service on impacts to threatened or endangered species was initiated in December 1980.

Members of the Kingman Grazing Advisory Board were also informed of District plans and progress in board meetings held on March 6, 1979, June 12, 1979, November 1, 1979, June 17, 1980, and November 5, 1980. At these meetings board members were asked for comments and participation.

APPENDIX 2-1
FOOTNOTES FOR LIVESTOCK GRAZING SUMMARY BY ALLOTMENT

[1] Includes public land and all land owned or leased by the allottee.

[2] Allotment managed nonintensively and only Federal land is considered.

[3] Only Federal land was surveyed on Cane Springs Wash.

[4] No valid comparison can be made because present allowable use includes nonpublic land, whereas only Federal land was surveyed to determine present capacity.

[5] Only that portion of Hualapai Peak allotment that is to be retained as a grazing allotment was surveyed, and thus a valid comparison cannot be made.

[6] Only Federal rangeland was surveyed on Sandy and Little Cane allotments.

[7] Does not include private and State land on the proposed nonintensive unit.

3. Substitute the following entries for the designated allotments in Appendix 2-1, Livestock Grazing Summary by Allotment, pages 139 and 140:

	Allotment	Present Allowable Use	Average License 1975-1980	Proposed Action	Percent Changes		No Action	Percent Changes		Moderate Management	Percent Changes		Wildlife Enhancement	Percent Changes		Eliminate Livestock	Percent Changes	
					Present Allowable Use	Average License		Present Alloweble Use	Average License		Present Alloweble Use	Average License		Present Allowable Use	Average License		Present Allowable Use	Average License
		Fed[1] / Fed + Cont	Fed / Fed + Cont	Fed[1] / Fed + Cont	(Fed + Cont)		Fed / Fed + Cont	(Fed + Cont)		Fed / Fed + Cont	(Fed + Cont)		Fed / Fed + Cont	(Fed + Cont)		Fed / Fed + Cont	(Fed Only)	
0116	Byner	588 / 588[2]	588 / 588[2]	203 / 203	- 65	- 65	588 / 588[2]	0	0	183 / 183	- 69	- 69	157 / 157	- 73	- 73	0 / NA		-100
0049	Rayner Wash	76 / 76[2]	76 / 76[2]	31 / 31	- 59	- 59	76 / 76	0	0	28 / 28	- 63	- 63	25 / 25	- 67	- 67	0 / NA		-100
0107	Kellie	264 / 264[2]	264 / 264[2]	50 / 50	- 81	- 81	264 / 264	0	0	45 / 45	- 83	- 83	40 / 40	- 85	- 85	0 / NA		-100
0075	White Spring	60 / 60[2]	60 / 60[2]	50 / 50	- 17	- 17	60 / 60	0	0	45 / 45	- 25	- 25	40 / 40	- 33	- 33	0 / NA		-100
				600	600	361			600				325			NA		
0011	Boriana	'A'	2,279 / 2,424	1,320 / 1,404	2,478 / 2,650	+ 9	+ 89	2,279 / 2,424	0	0	2,230 / 2,385	- 2	+ 70	1,982 / 2,120	- 13	+ 51	0 / NA		-100
		'B'	Ephemeral / Ephemeral	NA / NA	0 / 0	0	0	Ephemeral	0	0	0 / 0	0	0	0 / 0	0	0	0 / NA		NA
0012	Bottleneck Wash		12 / 12	12 / 12	12 / 12	0	0	12 / 12	0	0	11 / 11	- 8	- 8	10 / 10	- 17	- 17	0 / NA		-100
0013	Burro Creek		720 / 900	720 / 900	264 / 381	- 58	- 58	720 / 900	0	0	238 / 343	- 62	- 62	0 / 94	- 90	- 90	0 / NA		-100
0014	Burro Creek Ranch		1,674 / 1,860	1,674 / 1,860	781 / 866	- 53	- 53	1,674 / 1,860	0	0	703 / 779	- 58	- 58	618 / 686	- 63	- 63	0 / NA		-100
0116	Byner		876 / 876[2]	876 / 876[2]	203 / 203	- 77	- 77	876 / 876[2]	0	0	183 / 183	- 79	- 79	157 / 157	- 82	- 82	0 / NA		-100
0016	Cane Springs Wash	'A'	189 / 420	146 / 324	59 / 59[3]	Reference Footnote 4		189 / 420	0	0	53 / 53	Reference Footnote 4		47 / 47	Reference Footnote 4		0 / NA		-100
		'B'	NA / NA	NA / NA	5 / 5	Reference Footnote 4		NA / NA	0	0	5 / 5	Reference Footnote 4		4 / 4	Reference Footnote 4		0 / NA		NA
0021	Chicken Springs		4,639 / 7,248	2,534 / 3,960	3,076 / 6,165	- 15	+ 56	4,639 / 7,248	0	0	2,768 / 5,549	- 23	+ 40	2,461 / 4,932	- 32	- 25	0 / NA		-100
0022	Chino Springs		360 / 360	0 / 0	0 / 0	-100	0	360 / 360	0	0	0 / 0	-100	0	0 / 0	-100	0	0 / NA		-100
0028	Diamond Joe		2,321 / 2,976	2,321 / 2,976	563 / 749	- 75	- 75	2,321 / 2,976	0	0	507 / 674	- 77	- 77	563 / 799	- 75	- 75	0 / NA		-100
0031	DOR		Ephemeral / Ephemeral	NA / NA	0 / 0	0	NA	0 / 0	0	0	0 / 0	NA	NA	0 / 0	NA	NA	0 / NA		-100
0033	Fancher Mountain		360 / 360[2]	360 / 360[2]	231 / 231	- 36	- 36	360 / 360	0	0	208 / 208	- 42	- 42	231 / 231	- 36	- 36	0 / NA		-100
0035	Francis Creek		6,564 / 12,384	6,564 / 12,384	6,853 / 13,211	+ 7	+ 7	6,564 / 12,384	0	0	6,168 / 11,890	- 4	- 4	5,472 / 10,559	- 15	- 15	0 / NA		-100
0103	Gibson		1,968 / 1,968[2]	1,968 / 1,968[2]	202 / 343	NA	NA	1,968 / 1,968	0	0	182 / 309	NA	NA	153 / 265	NA	NA	0 / NA		-100
0038	Gray Wash		281 / 540	281 / 540	186 / 269	- 50	- 50	281 / 540	0	0	167 / 242	- 55	- 55	149 / 215	- 60	- 60	0 / NA		-100
0039	Greenwood Community		968 / 1,008	207 / 216	284 / 290	- 71	+ 34	968 / 1,008	0	0	256 / 261	- 74	+ 21	284 / 290	- 71	+ 34	0 / NA		-100
0040	Greenwood Pk. Community		2,080 / 2,568	2,080 / 2,568	588 / 614	- 76	- 76	2,080 / 2,568	0	0	529 / 553	- 78	- 78	440 / 461	- 82	- 82	0 / NA		-100

APPENDIX 2-1 (Continued)
LIVESTOCK GRAZING SUMMARY BY ALLOTMENT

	Allotment	Present Allowable Use	Average License 1975-1980	Proposed Action	Percent Changes: Present Allowable Use	Percent Changes: Average License	Continue Present Management	Percent Changes: Present Allowable Use	Percent Changes: Average License	Moderate Management	Percent Changes: Present Allowable Use	Percent Changes: Average License	Wildlife Enhancement	Percent Changes: Present Allowable Use	Percent Changes: Average License	Eliminate Livestock	Percent Changes: Present Allowable Use	Percent Changes: Average License
		Fed[1] / Fed + Cont	Fed / Fed + Cont	Fed[1] / Fed + Cont	(Fed + Cont)		Fed / Fed + Cont	(Fed + Cont)		Fed / Fed + Cont	(Fed + Cont)		Fed / Fed + Cont	(Fed + Cont)		Fed / Fed + Cont	(Fed Only)	
0041	Groom Peak	243 / 312	243 / 312	186 / 226	- 28	- 28	243 / 312	0	0	167 / 203	- 35	- 35	149 / 181	- 42	- 42	0 / NA	-100	
0043	Happy Jack Wash	1,080 / 1,080	581 / 581	451 / 453	- 59	- 59	864 / 1,080	0	0	406 / 408	- 63	- 63	361 / 362	- 67	- 67	0 / NA	-100	
0046	Hot Springs	48 / 60	48 / 60	5 / 5	- 92	- 92	48 / 60	0	0	4 / 4	- 93	- 93	5 / 5	- 92	- 92	0 / NA	-100	
0047	Hualapai Peak	720 / 4,800	720 / 4,800	90 / 189[5]	NA	NA	720 / 4,800	0	0	81 / 170	NA	NA	66 / 145	NA	NA	0 / NA	-100	
2105	JJJ	60 / 60[2]	60 / 60[2]	0 / 0	-100	-100	60 / 60	0	0	0 / 0	-100	-100	0 / 0	-100	-100	0 / NA	-100	
0049	Kayser Wash	252 / 252	252 / 252	31 / 31	- 48	- 48	252 / 252	0	0	28 / 28	- 53	- 53	25 / 25	- 58	- 58	0 / NA	-100	
0107	Kellis	264 / 264	264 / 264	50 / 50	- 17	- 17	264 / 264	0	0	45 / 45	- 25	- 25	40 / 40	- 33	- 33	0 / NA	-100	
0050	Kent's Cane Spring 'A'	1,214 / 2,759	1,183 / 2,688	1,040 / 2,457	- 11	- 9	1,214 / 2,759	0	0	936 / 2,211	- 20	- 18	826 / 1,961	- 29	- 27	0 / NA	-100	
	'B'	96 / 96[2]	96 / 96[2]	115 / 115	+ 20	+ 20				104 / 104	+ 5	+ 5	92 / 92	- 4	- 4	0 / NA	-100	
0051	La Cienega	6,753 / 15,348	3,210 / 7,296	1,979 / 4,994	- 67	- 32	6,753 / 15,348	0	0	1,781 / 4,495	- 71	- 38	1,583 / 3,995	- 74	- 45	0 / NA	-100	
0052	Lazy Yu 'A'	912 / 1,403	481 / 744	507 / 802	- 43	+ 7	912 / 1,403	0	0	456 / 722	- 49	- 3	406 / 642	- 54	- 14	0 / NA	-100	
	'B'	144 / 144[2]	144 / 144[2]	80 / 80	- 44	- 44	144 / 144	0	0	72 / 72	- 50	- 50	64 / 64	- 56	- 56	0 / NA	-100	
0110	Lines	1,577 / 2,628	1,577 / 2,628	579 / 766	- 71	- 71	1,577 / 2,628	0	0	521 / 689	- 74	- 74	463 / 613	- 77	- 77	0 / NA	-100	
0083	Little Cane	376 / 396	308 / 324	104 / 104[6]	NA	NA	376 / 396	0	0	94 / 94[6]	NA	NA	83 / 83[6]	NA	NA	0 / NA	-100	
0054	Los Molinos	2,820 / 3,000	1,602 / 1,704	801 / 858	- 71	- 50	2,820 / 3,000	0	0	721 / 772	- 74	- 55	641 / 686	- 77	- 60	0 / NA	-100	
0111	McElhaney	1,800 / 1,800	1,800 / 1,800	786 / 786	- 56	- 56	1,800 / 1,800	0	0	707 / 707	- 61	- 61	623 / 623	- 65	- 65	0 / NA	-100	
0063	Round Valley	48 / 48[2]	48 / 48[2]	17 / 17	- 65	- 65	48 / 48	0	0	15 / 15	- 69	- 69	17 / 17	- 65	- 65	0 / NA	-100	
0064	Sandy 'A'	198 / 300	198 / 300	19 / 19[6]	NA	NA	198 / 300	0	0	17 / 17[6]	NA	NA	15 / 15[6]	NA	NA	0 / NA	-100	
	'B'	NA / NA	NA / NA	18 / 18	NA	NA	NA / NA	NA	NA	16 / 16	NA	NA	15 / 15	NA	NA	0 / NA	NA	
0115	Sweetmilk	564 / 564[2]	564 / 564[2]	453 / 453	- 20	- 20	564 / 564	0	0	408 / 408	- 28	- 28	362 / 362	- 36	- 36	0 / NA	-100	
0069	Trout Creek	60 / 60[2]	60 / 60[2]	31 / 31	- 48	- 48	60 / 60	0	0	28 / 28	- 53	- 53	25 / 25	- 58	- 58	0 / NA	-100	
0073	Walnut Creek	7,141 / 8,208	4,740 / 5,448	2,637 / 3,015	- 63	- 45	7,141 / 8,208	0	0	2,373 / 2,714	- 67	- 50	2,101 / 2,403	- 71	- 56	0 / NA	-100	
0075	White Spring	60 / 60[2]	48 / 48[2]	50 / 50	- 17	- 17	60 / 60	0	0	45 / 45	- 25	- 25	40 / 40	- 33	- 33	0 / NA	-100	
0076	Wikieup	684 / 900	283 / 372	70 / 124	- 86	- 67	684 / 900	0	0	63 / 112	- 88	- 70	56 / 99	- 89	- 73	0 / NA	-100	
0078	Yellow Pine 'A'	3,475 / 9,144	2,768 / 7,284	1,170 / 2,018[7]	NA	NA	3,475 / 9,144	0	0	1,053 / 1,816	NA	NA	936 / 1,614	NA	NA	0 / NA	-100	
	'B'	NA / NA	NA / NA	30 / 30	NA	NA	NA / NA	NA	NA	27 / 27	NA	NA	19 / 19	NA	NA	NA / NA	NA	
	Totals (AUMS)	74,417 / 111,742	55,696 / 84,677	34,242 / 52,711			74,417 / 111,742			30,819 / 47,443			27,272 / 42,086			0 / NA		

APPENDICES 2-2 AND 2-3
FOOTNOTES FOR INITIAL VEGETATION ALLOCATION AND
PROJECTED VEGETATION PRODUCTION AND ALLOCATION

The following footnotes apply to Appendices 2-2 and 2-3.

[1] All figures are for public land only.

[2] Total usable forage production equals total forage production multiplied by its allowable use factor (AUF) and includes forage that is unsuitable for livestock because of inaccessibility and diet restrictions.

[3] Forage would be allocated for the following big-game species: elk, deer, antelope, javelina, and bighorn sheep. Appendix 2-6 shows by allotment the specific numbers of big game to which forage would be allocated.

[4] The proposed grazing management program, elimination of livestock grazing, and moderate grazing management alternatives allocate forage to existing numbers of big game and wild burros.

[5] Forage would not be allocated for big game and wild burros under the continuation of present management (no action) alternative.

[6] The wildlife enhancement alternative would allocate forage to "reasonable" numbers of wildlife--the number that the Arizona Game and Fish Department and BLM wildlife biologists estimate could be supported at present.

[7] Other resources include watershed protection and use by other animals.

APPENDIX 2-2
INITIAL VEGETATION ALLOCATION [1]

Proposed Action

	Allotment	Total Vegetation Production (lbs)	Total Usable Forage Production[2] (lbs) / (AUMs)	Initial Allocation (lbs) / (AUMs) Livestock	Burros	Big Game[3,4]	Other Resources[7] (lbs)
0001	Alamo Crossing	5,271,746	961,600 1,202	0 0	72,000 90	40,800 51	5,158,946
0002	Arrastra Mountain	11,123,498	2,305,751 2,882	849,600 1,062	62,400 78	165,600 207	10,045,898
0003	Artillery Range	30,771,152	6,148,800 7,686	1,189,600 1,487	81,600 102	152,000 190	29,347,952
0005	Bagdad	11,797,223	2,673,527 3,342	876,800 1,096	48,000 60	144,000 180	10,728,423
0006	Bateman Spring	7,006,760	1,652,175 2,065	214,400 268	0 0	50,400 63	6,741,960
0008	Big Sandy	30,107,735	7,814,449 9,768	2,340,000 2,925	0 0	656,800 821	27,110,935
0009	Black Mesa	3,877,085	947,003 1,184	256,000 320	4,800 6	64,000 80	3,552,285
0011	Boriana	21,799,436	5,669,537 7,087	1,982,400 2,478	0 0	416,800 521	19,400,236
0012	Bottleneck Wash	94,671	36,116 45	9,600 12	0 0	9,600 12	75,471
0013	Burro Creek	4,209,147	1,004,268 1,255	211,200 264	0 0	36,000 45	3,961,947
0014	Burro Creek Ranch	16,414,280	3,994,018 4,993	624,800 781	48,000 60	277,600 347	15,463,880
0116	Byner	2,031,567	488,650 611	162,400 203	0 0	38,400 48	1,830,767
0016	Cane Springs Wash	626,771	136,481 171	51,200 64	0 0	25,600 32	549,971
0021	Chicken Springs	42,763,841	8,886,360 11,108	2,460,800 3,076	0 0	412,800 516	39,890,241
0022	Chino Springs	8,033,760	1,686,785 2,108	0 0	38,400 48	23,200 29	7,972,160
0028	Diamond Joe	10,649,769	1,986,766 2,483	450,400 563	0 0	298,400 373	9,900,969
0031	DOR	548,238	68,947 86	0 0	0 0	4,800 6	543,438
0033	Fancher Mountain	1,502,659	412,687 516	184,800 231	0 0	31,200 39	1,286,659
0035	Francis Creek	35,065,927	9,600,012 12,000	5,482,400 6,853	230,400 288	519,200 649	28,833,927
0103	Gibson	7,734,452	1,343,949 1,680	161,600 202	0 0	48,000 60	7,524,852
0038	Gray Wash	3,564,283	933,261 1,167	148,800 186	0 0	25,600 32	3,389,883
0039	Greenwood Community	7,277,146	1,682,593 2,103	227,200 284	38,400 48	50,400 63	6,961,146
0040	Greenwood Pk. Community	13,197,502	3,195,783 3,995	470,400 588	43,200 54	131,200 164	12,552,702
0041	Groom Peak	2,502,614	655,938 820	148,800 186	0 0	96,800 121	2,257,014
0043	Happy Jack Wash	9,294,964	1,886,846 2,359	360,800 451	0 0	21,600 27	8,912,564
0046	Hot Springs	429,328	82,143 103	4,000 5	0 0	4,800 6	420,528
0047	Hualapai Peak	4,658,004	732,689 916	72,000 90	0 0	182,400 228	4,403,604
2105	JJJ	212,100	33,918 42	0 0	0 0	7,200 9	204,900
0049	Kayser Wash	223,577	59,745 75	24,800 31	0 0	7,200 9	191,577
0107	Kellis	722,406	169,657 212	40,000 50	0 0	57,600 72	624,806
0050	Kent's Cane Spring	12,276,181	2,619,754 3,275	924,000 1,155	0 0	323,200 404	11,028,981
0051	La Cienega	36,391,975	7,622,636 9,528	1,583,200 1,979	0 0	220,000 275	34,588,775
0052	Lazy Yu	6,778,028	1,323,764 1,655	469,600 587	0 0	211,200 264	6,097,228
0110	Lines	6,348,911	1,537,868 1,922	463,200 579	0 0	69,600 87	5,816,111
0083	Little Cane	2,120,966	501,489 627	83,200 104	0 0	121,600 152	1,916,166
0054	Los Molinos	8,994,440	1,966,852 2,459	640,800 801	0 0	201,600 252	8,152,040
0111	McElhaney	6,167,527	1,373,075 1,716	628,800 786	0 0	106,400 133	5,432,327
0063	Round Valley	322,672	61,240 77	13,600 17	0 0	9,600 12	299,472
0064	Sandy	571,770	43,060 54	29,600 37	0 0	7,200 9	534,970
0115	Sweetmilk	2,697,130	812,751 1,016	362,400 453	0 0	49,600 62	2,285,130
0069	Trout Creek	271,040	61,634 77	24,800 31	0 0	4,800 6	241,440
0073	Walnut Creek	43,386,053	9,313,021 11,641	2,109,600 2,637	0 0	967,200 1,209	40,309,253
0075	White Spring	562,890	131,780 165	40,000 50	0 0	20,800 26	502,090
0076	Wikieup	4,507,208	1,085,948 1,357	56,000 70	0 0	64,000 80	4,387,208
0078	Yellow Pine	16,575,351	3,537,153 4,421	960,000 1,200	0 0	494,400 618	15,120,951
	TOTALS	441,483,783	99,242,065 124,053	27,393,600 34,242	667,200 834	6,871,200 8,589	406,551,783

APPENDIX 2-2 (Continued)
INITIAL VEGETATION ALLOCATION[1]

Continuation of Present Management

	Allotment	Total Vegetation Production (lbs)	Total Usable Forage Production[2] (lbs / AUMs)	Initial Allocation (lbs / AUMs) Livestock	Burros	Big Game[5]	Other Resources[7] (lbs)
0001	Alamo Crossing	5,271,746	961,600 1,202	960,000 1,200	0 0	0 0	4,311,746
0002	Arrastra Mountain	11,123,498	2,305,751 2,882	1,596,000 1,995	0 0	0 0	9,527,498
0003	Artillery Range	30,771,152	6,148,800 7,686	3,212,800 4,016	0 0	0 0	27,558,352
0005	Bagdad	11,797,223	2,673,527 3,342	1,348,800 1,686	0 0	0 0	10,448,423
0006	Bateman Spring	7,006,760	1,652,175 2,065	892,800 1,116	0 0	0 0	6,113,960
0008	Big Sandy	30,107,735	7,814,449 9,768	6,387,200 7,984	0 0	0 0	23,720,535
0009	Black Mesa	3,877,085	947,003 1,184	432,000 540	0 0	0 0	3,445,085
0011	Borlana	21,799,436	5,669,537 7,087	1,823,200 2,279	0 0	0 0	19,976,236
0012	Bottleneck Wash	94,671	36,116 45	9,600 12	0 0	0 0	85,071
0013	Burro Creek	4,209,147	1,004,268 1,255	576,000 720	0 0	0 0	3,633,147
0014	Burro Creek Ranch	16,414,280	3,994,018 4,993	1,339,200 1,674	0 0	0 0	15,075,080
0116	Byner	2,031,567	488,650 611	700,800 876	0 0	0 0	1,330,767
0016	Cane Springs Wash	626,771	136,481 171	151,200 189	0 0	0 0	475,571
0021	Chicken Springs	42,763,841	8,886,360 11,108	3,711,200 4,639	0 0	0 0	39,052,641
0022	Chino Springs	8,033,760	1,686,785 2,108	288,000 360	0 0	0 0	7,745,760
0028	Diamond Joe	10,649,769	1,986,766 2,483	1,856,800 2,321	0 0	0 0	8,792,969
0031	DOR	548,238	68,947 86	0 0	0 0	0 0	548,238
0033	Fancher Mountain	1,502,659	412,687 516	288,000 360	0 0	0 0	1,214,659
0035	Francis Creek	35,065,927	9,600,012 12,000	5,251,200 6,564	0 0	0 0	29,814,727
0103	Gibson	7,734,452	1,343,949 1,680	1,574,400 1,968	0 0	0 0	6,160,052
0038	Gray Wash	3,564,283	933,261 1,167	224,800 281	0 0	0 0	3,339,483
0039	Greenwood Community	7,277,146	1,682,593 2,103	774,400 968	0 0	0 0	6,502,746
0040	Greenwood Pk. Community	13,197,502	3,195,783 3,995	1,664,000 2,080	0 0	0 0	11,533,502
0041	Groom Peak	2,502,614	655,938 820	194,400 243	0 0	0 0	2,308,214
0043	Happy Jack Wash	9,294,964	1,886,846 2,359	864,000 1,080	0 0	0 0	8,430,964
0046	Hot Springs	429,328	82,143 103	38,400 48	0 0	0 0	390,928
0047	Hualapai Peak	4,658,004	732,689 916	576,000 720	0 0	0 0	4,082,004
2105	JJJ	212,100	33,918 42	48,000 60	0 0	0 0	164,100
0049	Kayser Wash	223,577	59,745 75	201,600 252	0 0	0 0	21,977
0107	Kellis	722,406	169,657 212	211,200 264	0 0	0 0	511,206
0050	Kent's Cane Spring	12,276,181	2,619,754 3,275	1,048,000 1,310	0 0	0 0	11,228,181
0051	La Cienega	36,391,975	7,622,636 9,528	5,402,400 6,753	0 0	0 0	30,989,575
0052	Lazy Yu	6,778,028	1,323,764 1,655	844,800 1,056	0 0	0 0	5,933,228
0110	Lines	6,348,911	1,537,868 1,922	1,261,600 1,577	0 0	0 0	5,087,311
0083	Little Cane	2,120,966	501,489 627	300,800 376	0 0	0 0	1,820,166
0054	Los Molinos	8,994,440	1,966,852 2,459	2,256,000 2,820	0 0	0 0	6,738,440
0111	McElhaney	6,167,527	1,373,075 1,716	1,440,000 1,800	0 0	0 0	4,727,527
0063	Round Valley	322,672	61,240 77	38,400 48	0 0	0 0	284,272
0064	Sandy	571,770	43,060 54	158,400 198	0 0	0 0	413,370
0115	Sweetmilk	2,697,130	812,751 1,016	451,200 564	0 0	0 0	2,245,930
0069	Trout Creek	271,040	61,634 77	48,000 60	0 0	0 0	223,040
0073	Walnut Creek	43,386,053	9,313,021 11,641	5,712,800 7,141	0 0	0 0	37,673,253
0075	White Spring	562,890	131,780 165	48,000 60	0 0	0 0	514,890
0076	Wikieup	4,507,208	1,085,948 1,357	547,200 684	0 0	0 0	3,960,008
0078	Yellow Pine	16,575,351	3,537,153 4,421	2,780,000 3,475	0 0	0 0	13,795,351
	TOTALS	441,483,783	99,242,065 124,053	59,533,600 74,417	0 0	0 0	381,950,183

APPENDIX 2-2 (Continued)
INITIAL VEGETATION ALLOCATION[1]

Moderate Grazing Management

	Allotment	Total Vegetation Production (lbs)	Total Usable Forage Production[2] (lbs / AUMs)	Initial Allocation (lbs / AUMs) Livestock	Burros	Big Game[3,4]	Other Resources[7] (lbs)
0001	Alamo Crossing	5,271,746	961,600 1,202	0 0	72,000 90	40,800 51	5,158,946
0002	Arrastra Mountain	11,123,498	2,305,751 2,882	764,800 956	62,400 78	165,600 207	10,130,698
0003	Artillery Range	30,771,152	6,148,800 7,686	1,070,400 1,338	81,600 102	152,000 190	29,467,152
0005	Bagdad	11,797,223	2,673,527 3,342	788,800 986	48,000 60	144,000 180	10,816,423
0006	Bateman Spring	7,006,760	1,652,175 2,065	192,960 241	0 0	50,400 63	6,763,400
0008	Big Sandy	30,107,735	7,814,449 9,768	2,106,400 2,633	0 0	656,800 821	27,344,535
0009	Black Mesa	3,877,085	947,003 1,184	230,400 288	4,800 6	64,000 80	3,577,885
0011	Boriana	21,799,436	5,669,537 7,087	1,784,000 2,230	0 0	416,800 521	19,598,636
0012	Bottleneck Wash	94,671	36,116 45	8,800 11	0 0	9,600 12	76,271
0013	Burro Creek	4,209,147	1,004,268 1,255	190,400 238	0 0	36,000 45	3,982,747
0014	Burro Creek Ranch	16,414,280	3,994,018 4,993	562,400 703	48,000 60	277,600 347	15,526,280
0116	Byner	2,031,567	488,650 611	146,400 183	0 0	38,400 48	1,846,767
0016	Cane Springs Wash	626,771	136,481 171	46,400 58	0 0	25,600 32	554,771
0021	Chicken Springs	42,763,841	8,886,360 11,108	2,214,400 2,768	0 0	412,800 516	40,136,641
0022	Chino Springs	8,033,760	1,686,785 2,108	0 0	38,400 48	23,200 29	7,972,160
0028	Diamond Joe	10,649,769	1,986,766 2,483	405,600 507	0 0	298,400 373	9,945,769
0031	DOR	548,238	68,947 86	0 0	0 0	4,800 6	543,438
0033	Fancher Mountain	1,502,659	412,687 516	166,320 208	0 0	31,200 39	1,305,139
0035	Francis Creek	35,065,927	9,600,012 12,000	4,934,400 6,168	230,400 288	519,200 649	29,381,927
0103	Gibson	7,734,452	1,343,949 1,680	145,600 182	0 0	48,000 60	7,540,852
0038	Gray Wash	3,564,283	933,261 1,167	133,600 167	0 0	25,600 32	3,405,083
0039	Greenwood Community	7,277,146	1,682,593 2,103	204,800 256	38,400 48	50,400 63	6,983,546
0040	Greenwood Pk. Community	13,197,502	3,195,783 3,995	423,360 529	43,200 54	131,200 164	12,599,742
0041	Groom Peak	2,502,614	655,938 820	133,600 167	0 0	96,800 121	2,272,214
0043	Happy Jack Wash	9,294,964	1,886,846 2,359	324,800 406	0 0	21,600 27	8,948,564
0046	Hot Springs	429,328	82,143 103	4,000 5	0 0	4,800 6	420,528
0047	Hualapai Peak	4,658,004	732,689 916	64,800 81	0	182,400 228	4,410,804
2105	JJJ	212,100	33,918 42	0 0	0 0	7,200 9	204,900
0049	Kayser Wash	223,577	59,745 75	22,400 28	0 0	7,200 9	193,977
0107	Kellis	722,406	169,657 212	36,000 45	0 0	57,600 72	628,806
0050	Kent's Cane Spring	12,276,181	2,619,754 3,275	832,000 1,040	0 0	323,200 404	11,120,981
0051	La Cienega	36,391,975	7,622,636 9,528	1,424,800 1,781	0 0	220,000 275	34,747,175
0052	Lazy Yu	6,778,028	1,323,764 1,655	422,400 528	0 0	211,200 264	6,144,428
0110	Lines	6,348,911	1,537,868 1,922	416,800 521	0 0	69,600 87	5,862,511
0083	Little Cane	2,120,966	501,489 627	75,200 94	0 0	121,600 152	1,924,166
0054	Los Molinos	8,994,440	1,966,852 2,459	576,800 721	0 0	201,600 252	8,216,040
0111	McElhaney	6,167,527	1,373,075 1,716	565,600 707	0 0	106,400 133	5,495,527
0063	Round Valley	322,672	61,240 77	12,000 15	0 0	9,600 12	301,072
0064	Sandy	571,770	43,060 54	26,400 33	0 0	7,200 9	538,170
0115	Sweetmilk	2,697,130	812,751 1,016	326,400 408	0 0	49,600 62	2,321,130
0069	Trout Creek	271,040	61,634 77	22,400 28	0 0	4,800 6	243,840
0073	Walnut Creek	43,386,053	9,313,021 11,641	1,898,400 2,373	0 0	967,200 1,209	40,520,453
0075	White Spring	562,890	131,780 165	36,000 45	0 0	20,800 26	506,090
0076	Wikieup	4,507,208	1,085,948 1,357	50,400 63	0 0	64,000 80	4,392,808
0078	Yellow Pine	16,575,351	3,537,153 4,421	864,000 1,080	0 0	494,400 618	15,216,951
	TOTALS	441,483,783	99,242,065 124,053	24,655,200 30,819	667,200 834	6,871,200 8,589	409,290,183

APPENDIX 2-2 (Continued)
INITIAL VEGETATION ALLOCATION[1]

Wildlife Enhancement

	Allotment	Total Vegetation Production (lbs)	Total Usable Forage Production[2] (lbs / AUMs)	Initial Allocation (lbs / AUMs) Livestock	Burros	Big Game[3,6]	Other Resources[7] (lbs)
0001	Alamo Crossing	5,271,746	961,600 1,202	0 0	72,000 90	55,200 69	5,144,546
0002	Arrastra Mountain	11,123,498	2,305,751 2,882	680,000 850	62,400 78	208,800 261	10,172,298
0003	Artillery Range	30,771,152	6,148,800 7,686	944,000 1,180	81,600 102	212,800 266	29,532,752
0005	Bagdad	11,797,223	2,673,527 3,342	697,600 872	48,000 60	300,000 375	10,751,623
0006	Bateman Spring	7,006,760	1,652,175 2,065	171,200 214	0 0	96,000 120	6,739,560
0008	Big Sandy	30,107,735	7,814,449 9,768	1,856,000 2,320	0 0	878,400 1,098	27,373,335
0009	Black Mesa	3,877,085	947,003 1,184	201,600 252	4,800 6	110,400 138	3,560,285
0011	Boriana	21,799,436	5,669,537 7,087	1,585,600 1,982	0 0	676,800 846	19,537,036
0012	Bottleneck Wash	94,671	36,116 45	8,000 10	0 0	9,600 12	77,071
0013	Burro Creek	4,209,147	1,004,268 1,255	0 0	0 0	98,400 123	4,110,747
0014	Burro Creek Ranch	16,414,280	3,994,018 4,993	494,400 618	48,000 60	311,200 389	15,560,680
0116	Byner	2,031,567	488,650 611	125,600 157	0 0	52,800 66	1,853,167
0016	Cane Springs Wash	626,771	136,481 171	40,800 51	0 0	42,400 53	543,571
0021	Chicken Springs	42,763,841	8,886,360 11,108	1,968,800 2,461	0 0	524,800 656	40,270,241
0022	Chino Springs	8,033,760	1,686,785 2,108	0 0	38,400 48	80,800 101	7,914,560
0028	Diamond Joe	10,649,769	1,986,766 2,483	450,400 563	0 0	503,200 629	9,696,169
0031	DOR	548,238	68,947 86	0 0	0 0	4,800 6	543,438
0033	Fancher Mountain	1,502,659	412,687 516	184,800 231	0 0	31,200 39	1,286,659
0035	Francis Creek	35,065,927	9,600,012 12,000	4,377,600 5,472	230,400 288	661,600 827	29,796,327
0103	Gibson	7,734,452	1,343,949 1,680	122,400 153	0 0	67,200 84	7,544,852
0038	Gray Wash	3,564,283	933,261 1,167	119,200 149	0 0	64,800 81	3,380,283
0039	Greenwood Community	7,277,146	1,682,593 2,103	227,200 284	38,400 48	76,800 96	6,934,746
0040	Greenwood Pk. Community	13,197,502	3,195,783 3,995	352,000 440	43,200 54	234,400 293	12,567,902
0041	Groom Peak	2,502,614	655,938 820	119,200 149	0 0	120,000 150	2,263,414
0043	Happy Jack Wash	9,294,964	1,886,846 2,359	288,800 361	0 0	26,400 33	8,979,764
0046	Hot Springs	429,328	82,143 103	4,000 5	0 0	14,400 18	410,928
0047	Hualapai Peak	4,658,004	732,689 916	52,800 66	0 0	247,200 309	4,358,004
2105	JJJ	212,100	33,918 42	0 0	0 0	7,200 9	204,900
0049	Kayser Wash	223,577	59,745 75	20,000 25	0 0	7,200 9	196,377
0107	Kellis	722,406	169,657 212	32,000 40	0 0	57,600 72	632,806
0050	Kent's Cane Spring	12,276,181	2,619,754 3,275	734,400 918	0 0	410,400 513	11,131,381
0051	La Cienega	36,391,975	7,622,636 9,528	1,266,400 1,583	0 0	314,400 393	34,811,175
0052	Lazy Yu	6,778,028	1,323,764 1,655	376,000 470	0 0	228,000 285	6,174,028
0110	Lines	6,348,911	1,537,868 1,922	370,400 463	0 0	122,400 153	5,856,111
0083	Little Cane	2,120,966	501,489 627	66,400 83	0 0	172,800 216	1,881,766
0054	Los Molinos	8,994,440	1,966,852 2,459	512,800 641	0 0	421,600 527	8,060,040
0111	McElhaney	6,167,527	1,373,075 1,716	498,400 623	0 0	210,400 263	5,458,727
0063	Round Valley	322,672	61,240 77	13,600 17	0 0	9,600 12	299,472
0064	Sandy	571,770	43,060 54	24,000 30	0 0	47,200 59	500,570
0115	Sweetmilk	2,697,130	812,751 1,016	289,600 362	0 0	104,800 131	2,302,730
0069	Trout Creek	271,040	61,634 77	20,000 25	0 0	4,800 6	246,240
0073	Walnut Creek	43,386,053	9,313,021 11,641	1,680,800 2,101	0 0	1,192,000 1,490	40,513,253
0075	White Spring	562,890	131,780 165	32,000 40	0 0	28,800 36	502,090
0076	Wikieup	4,507,208	1,085,948 1,357	44,800 56	0 0	88,800 111	4,373,608
0078	Yellow Pine	16,575,351	3,537,153 4,421	764,000 955	0 0	631,200 789	15,180,151
	TOTALS	441,483,783	99,242,065 124,053	21,817,600 27,272	667,200 834	9,769,600 12,212	409,229,383

APPENDIX 2-2 (Continued)
INITIAL VEGETATION ALLOCATION[1]

Elimination of Livestock Grazing

	Allotment	Total Vegetation Production (lbs)	Total Usable Forage Production[2] (lbs / AUMs)	Initial Allocation (lbs / AUMs) Livestock	Burros	Big Game[3,4]	Other Resources[7] (lbs)
0001	Alamo Crossing	5,271,746	961,600 1,202	0 0	72,000 90	40,800 51	5,158,946
0002	Arrastra Mountain	11,123,498	2,305,731 2,882	0 0	192,000 240	165,600 207	10,765,898
0003	Artillery Range	30,771,152	6,148,800 7,686	0 0	259,200 324	152,000 190	30,359,952
0005	Bagdad	11,797,223	2,673,527 3,342	0 0	321,600 402	144,000 180	11,331,623
0006	Bateman Spring	7,006,760	1,652,175 2,065	0 0	0 0	50,400 63	6,956,360
0008	Big Sandy	30,107,735	7,814,449 9,768	0 0	0 0	656,800 821	29,450,935
0009	Black Mesa	3,877,085	947,003 1,184	0 0	19,200 24	64,000 80	3,793,885
0011	Boriana	21,799,436	5,669,537 7,087	0 0	0 0	416,800 521	21,382,636
0012	Bottleneck Wash	94,671	36,116 45	0 0	0 0	9,600 12	85,071
0013	Burro Creek	4,209,147	1,004,268 1,255	0 0	0 0	36,000 45	4,173,147
0014	Burro Creek Ranch	16,414,280	3,994,018 4,993	0 0	172,800 216	277,600 347	15,963,880
0116	Byner	2,031,567	488,650 611	0 0	0 0	38,400 48	1,993,167
0016	Cane Springs Wash	626,771	136,481 171	0 0	0 0	25,600 32	601,171
0021	Chicken Springs	42,763,841	8,886,360 11,108	0 0	0 0	412,800 516	42,351,041
0022	Chino Springs	8,033,760	1,686,785 2,108	0 0	120,000 150	23,200 29	7,890,560
0028	Diamond Joe	10,649,769	1,986,766 2,483	0 0	0 0	298,400 373	10,351,369
0031	DOR	548,238	68,947 86	0 0	0 0	4,800 6	543,438
0033	Fancher Mountain	1,502,659	412,687 516	0 0	0 0	31,200 39	1,471,459
0035	Francis Creek	35,065,927	9,600,012 12,000	0 0	720,000 900	519,200 649	33,826,727
0103	Gibson	7,734,452	1,343,949 1,680	0 0	0 0	48,000 60	7,686,452
0038	Gray Wash	3,564,283	933,261 1,167	0 0	0 0	25,600 32	3,538,683
0039	Greenwood Community	7,277,146	1,682,593 2,103	0 0	120,000 150	50,400 63	7,106,746
0040	Greenwood Pk. Community	13,197,502	3,195,783 3,995	0 0	321,600 402	131,200 164	12,744,702
0041	Groom Peak	2,502,614	655,938 820	0 0	0 0	96,800 121	2,405,814
0043	Happy Jack Wash	9,294,964	1,886,846 2,359	0 0	0 0	21,600 27	9,273,364
0046	Hot Springs	429,328	82,143 103	0 0	0 0	4,800 6	424,528
0047	Hualapai Peak	4,658,004	732,689 916	0 0	0 0	182,400 228	4,475,604
2105	JJJ	212,100	33,918 42	0 0	0 0	7,200 9	204,900
0049	Kayser Wash	223,577	59,745 75	0 0	0 0	7,200 9	216,377
0107	Kellis	722,406	169,657 212	0 0	0 0	57,600 72	664,806
0050	Kent's Cane Spring	12,276,181	2,619,754 3,275	0 0	0 0	323,200 404	11,952,981
0051	La Cienega	36,391,975	7,622,636 9,528	0 0	0 0	220,000 275	36,171,975
0052	Lazy Yu	6,778,028	1,323,764 1,655	0 0	0 0	211,200 264	6,566,828
0110	Lines	6,348,911	1,537,868 1,922	0 0	0 0	69,600 87	6,279,311
0083	Little Cane	2,120,966	501,489 627	0 0	0 0	121,600 152	1,999,366
0054	Los Molinos	8,994,440	1,966,852 2,459	0 0	0 0	201,600 252	8,792,840
0111	McElhaney	6,167,527	1,373,075 1,716	0 0	0 0	106,400 133	6,061,127
0063	Round Valley	322,672	61,240 77	0 0	0 0	9,600 12	313,072
0064	Sandy	571,770	43,060 54	0 0	0 0	7,200 9	564,570
0115	Sweetmilk	2,697,130	812,751 1,016	0 0	0 0	49,600 62	2,647,530
0069	Trout Creek	271,040	61,634 77	0 0	0 0	4,800 6	266,240
0073	Walnut Creek	43,386,053	9,313,021 11,641	0 0	0 0	967,200 1,209	42,418,853
0075	White Spring	562,890	131,780 165	0 0	0 0	20,800 26	542,090
0076	Wikieup	4,507,208	1,083,948 1,357	0 0	0 0	64,000 80	4,443,208
0078	Yellow Pine	16,575,351	3,537,153 4,421	0 0	0 0	494,400 618	16,080,951
	TOTALS	441,483,783	99,242,065 124,053	0 0	2,318,400 2,898	6,871,200 8,589	432,294,183

APPENDIX 2-3
PROJECTED VEGETATION PRODUCTION AND ALLOCATION [1]

Proposed Action

	Allotment	Total Vegetation Production (lbs)	Total Usable Forage Production[2] (lbs / AUMs)	Projected Allocation (lbs / AUMs) Livestock	Burros	Big Game[3,4]	Other Resources[7] (lbs)
0001	Alamo Crossing	5,271,746	961,600 1,202	0 0	72,000 90	55,200 69	5,144,546
0002	Arrastra Mountain	11,607,706	2,789,959 3,487	1,172,800 1,466	62,400 78	208,800 261	10,163,706
0003	Artillery Range	31,626,142	7,003,790 8,755	1,654,400 2,068	81,600 102	212,800 266	29,677,342
0005	Bagdad	12,144,782	3,021,086 3,776	1,094,400 1,368	48,000 60	300,000 375	10,702,382
0006	Bateman Spring	7,205,021	1,850,436 2,313	290,400 363	0 0	96,000 120	6,818,621
0008	Big Sandy	31,905,058	9,611,772 12,015	3,041,600 3,802	0 0	878,400 1,098	27,985,058
0009	Black Mesa	4,009,665	1,079,583 1,349	344,000 430	4,800 6	110,400 138	3,550,465
0011	Boriana	22,990,039	6,860,140 8,575	2,585,600 3,232	0 0	676,800 846	19,727,639
0012	Bottleneck Wash	94,671	36,116 45	9,600 12	0 0	9,600 12	75,471
0013	Burro Creek	4,359,787	1,154,908 1,444	243,200 304	0 0	98,400 123	4,018,187
0014	Burro Creek Ranch	17,253,024	4,832,762 6,041	1,149,600 1,437	48,000 60	336,000 420	15,719,424
0116	Byner	1,977,816	434,899 544	130,400 163	0 0	52,800 66	1,794,616
0016	Cane Springs Wash	632,230	141,940 177	52,000 65	0 0	42,400 53	537,830
0021	Chicken Springs	44,274,522	10,397,041 12,996	3,185,600 3,982	0 0	524,800 656	40,564,122
0022	Chino Springs	8,033,760	1,686,785 2,108	0 0	38,400 48	80,800 101	7,914,560
0028	Diamond Joe	10,888,181	2,225,178 2,781	774,400 968	0 0	503,200 629	9,610,581
0031	OOR	548,238	68,947 86	0 0	0 0	4,800 6	543,438
0033	Fancher Mountain	1,494,405	404,433 506	180,800 226	0 0	31,200 39	1,282,405
0035	Francis Creek	38,905,032	13,440,017 16,800	8,018,400 10,023	230,400 288	727,200 909	29,929,932
0103	Gibson	7,949,484	1,558,981 1,949	188,000 235	0 0	67,200 84	7,694,284
0038	Gray Wash	3,694,940	1,063,918 1,330	250,400 313	0 0	64,800 81	3,379,740
0039	Greenwood Community	7,462,231	1,867,678 2,335	333,600 417	38,400 48	76,800 96	7,013,431
0040	Greenwood Pk. Community	13,740,785	3,739,066 4,674	611,200 764	43,200 54	234,400 293	12,851,985
0041	Groom Peak	2,620,683	774,007 968	222,400 278	0 0	120,000 150	2,278,283
0043	Happy Jack Wash	9,370,438	1,962,320 2,453	501,600 627	0 0	26,400 33	8,842,438
0046	Hot Springs	429,328	82,143 103	4,000 5	0 0	14,400 18	410,928
0047	Hualapai Peak	4,811,869	886,554 1,109	94,400 118	0 0	247,200 309	4,470,269
2105	JJJ	212,100	33,918 42	0 0	0 0	7,200 9	204,900
0049	Kayser Wash	215,810	51,978 65	21,600 27	0 0	7,200 9	187,010
0107	Kellis	698,654	145,905 182	34,400 43	0 0	57,600 72	606,654
0050	Kent's Cane Spring	12,852,527	3,196,100 3,995	1,293,600 1,617	0 0	410,400 513	11,148,527
0051	La Cienega	37,764,049	8,994,710 11,243	2,029,600 2,537	0 0	314,400 393	35,420,049
0052	Lazy Yu	7,003,068	1,548,804 1,936	567,200 709	0 0	247,200 309	6,188,668
0110	Lines	6,610,349	1,799,306 2,249	550,400 688	0 0	122,400 153	5,937,549
0083	Little Cane	2,161,085	541,608 677	89,600 112	0 0	172,800 216	1,898,685
0054	Los Molinos	9,368,142	2,340,554 2,926	764,800 956	0 0	421,600 527	8,181,742
0111	McElhaney	6,414,681	1,620,229 2,025	741,600 927	0 0	210,400 263	5,462,681
0063	Round Valley	318,385	56,953 71	12,800 16	0 0	9,600 12	295,985
0064	Sandy	573,492	44,782 56	30,400 38	0 0	47,200 59	495,892
0115	Sweetmilk	2,461,432	577,053 721	257,600 322	0 0	104,800 131	2,099,032
0069	Trout Creek	264,260	54,854 69	22,400 28	0 0	4,800 6	237,060
0073	Walnut Creek	45,155,527	11,082,495 13,853	2,602,400 3,253	0 0	1,192,000 1,490	41,361,127
0075	White Spring	560,254	129,144 161	39,200 49	0 0	28,800 36	492,254
0076	Wikieup	4,615,803	1,194,543 1,493	395,200 494	0 0	88,800 111	4,131,803
0078	Yellow Pine	17,777,983	4,739,785 5,925	1,346,400 1,683	0 0	662,400 828	15,769,183
	TOTALS	460,330,083	118,088,365 147,611	36,932,000 46,165	667,200 834	9,910,400 12,388	412,820,483

APPENDIX 2-3 (Continued)

PROJECTED VEGETATION PRODUCTION AND ALLOCATION

Continuation of Present Management

	Allotment	Total Vegetation Production (lbs)	Total Usable Forage Production[2] (lbs / AUMs)	Projected Allocation (lbs / AUMs) Livestock	Burros	Big Game[5]	Other Resources[7] (lbs)
0001	Alamo Crossing	5,169,433	859,200 1,074	960,000 1,200	0 0	0 0	4,209,433
0002	Arrastra Mountain	10,823,750	2,006,003 2,508	1,596,000 1,995	0 0	0 0	9,227,750
0003	Artillery Range	30,099,374	5,476,800 6,846	3,212,800 4,016	0 0	0 0	26,886,574
0005	Bagdad	11,369,459	2,245,763 2,807	1,348,800 1,686	0 0	0 0	10,020,659
0006	Bateman Spring	6,907,630	1,553,045 1,941	892,800 1,116	0 0	0 0	6,014,830
0008	Big Sandy	29,638,868	7,345,582 9,182	6,387,200 7,984	0 0	0 0	23,251,668
0009	Black Mesa	3,725,565	795,483 994	432,000 540	0 0	0 0	3,293,565
0011	Boriana	21,686,045	5,556,146 6,945	1,823,200 2,279	0 0	0 0	19,862,845
0012	Bottleneck Wash	94,671	36,116 45	9,600 12	0 0	0 0	85,071
0013	Burro Creek	4,148,891	944,012 1,180	576,000 720	0 0	0 0	3,572,891
0014	Burro Creek Ranch	15,695,357	3,275,095 4,094	1,339,200 1,674	0 0	0 0	14,356,157
0116	Byner	1,977,816	434,899 556	700,800 876	0 0	0 0	1,277,016
0016	Cane Springs Wash	622,677	132,387 165	151,200 189	0 0	0 0	471,477
0021	Chicken Springs	42,141,796	8,264,315 10,330	3,711,200 4,639	0 0	0 0	38,430,596
0022	Chino Springs	7,881,949	1,534,974 1,919	288,000 360	0 0	0 0	7,593,949
0028	Diamond Joe	10,629,901	1,966,898 2,459	1,856,800 2,321	0 0	0 0	8,773,101
0031	DOR	544,791	65,500 82	0 0	0 0	0 0	544,791
0033	Fancher Mountain	1,494,405	404,433 506	288,000 360	0 0	0 0	1,206,405
0035	Francis Creek	31,609,923	6,144,008 7,800	5,251,200 6,564	0 0	0 0	26,358,723
0103	Gibson	7,613,497	1,222,994 1,529	1,574,400 1,968	0 0	0 0	6,039,097
0038	Gray Wash	3,517,620	886,598 1,108	224,800 281	0 0	0 0	3,292,820
0039	Greenwood Community	7,176,190	1,581,637 1,977	774,400 968	0 0	0 0	6,401,790
0040	Greenwood Pk. Community	12,782,050	2,780,331 3,475	1,664,000 2,080	0 0	0 0	3,328,000
0041	Groom Peak	2,325,511	478,835 599	194,400 243	0 0	0 0	2,131,111
0043	Happy Jack Wash	9,219,490	1,811,372 2,264	864,000 1,080	0 0	0 0	8,355,490
0046	Hot Springs	427,685	80,500 101	38,400 48	0 0	0 0	389,285
0047	Hualapai Peak	4,658,004	732,689 916	576,000 720	0 0	0 0	4,082,004
2105	JJJ	212,100	33,918 42	48,000 60	0 0	0 0	164,100
0049	Kayser Wash	215,810	51,978 65	201,600 252	0 0	0 0	14,210
0107	Kellis	698,654	145,905 182	211,200 264	0 0	0 0	487,454
0050	Kent's Cane Spring	12,118,996	2,462,569 3,078	1,048,000 1,310	0 0	0 0	11,070,996
0051	La Cienega	36,010,843	7,241,504 9,052	5,402,400 6,753	0 0	0 0	30,608,443
0052	Lazy Yu	6,711,839	1,257,575 1,572	844,800 1,056	0 0	0 0	5,867,039
0110	Lines	6,348,911	1,537,868 1,922	1,261,600 1,577	0 0	0 0	5,087,311
0083	Little Cane	2,115,951	496,474 621	300,800 376	0 0	0 0	1,815,151
0054	Los Molinos	8,876,429	1,848,841 2,311	2,256,000 2,820	0 0	0 0	6,620,429
0111	McElhaney	6,057,681	1,263,229 1,579	1,440,000 1,800	0 0	0 0	4,617,681
0063	Round Valley	318,385	56,953 71	38,400 48	0 0	0 0	279,985
0064	Sandy	570,048	41,338 52	158,400 198	0 0	0 0	411,648
0115	Sweetmilk	2,461,432	577,053 721	451,200 564	0 0	0 0	2,010,232
0069	Trout Creek	264,260	54,854 69	48,000 60	0 0	0 0	216,260
0073	Walnut Creek	43,292,923	9,219,891 11,525	5,712,800 7,141	0 0	0 0	37,580,123
0075	White Spring	560,254	129,144 161	48,000 60	0 0	0 0	512,254
0076	Wikieup	4,474,630	1,053,370 1,317	547,200 684	0 0	0 0	3,927,430
0078	Yellow Pine	16,398,493	3,360,295 4,200	2,780,000 3,475	0 0	0 0	13,618,493
	TOTALS	431,689,986	89,448,268 111,810	59,533,600 74,417	0 0	0 0	372,156,386

APPENDIX 2-3 (Continued)
PROJECTED VEGETATION PRODUCTION AND ALLOCATION

Moderate Grazing Management

	Allotment	Total Vegetation Production (lbs)	Total Usable Forage Production[2] (lbs) / (AUMs)	Projected Allocation (lbs) / (AUMs) Livestock	Burros	Big Game[3,4]	Other Resources[7] (lbs)
0001	Alamo Crossing	5,271,746	961,600 1,202	0 0	72,000 90	55,200 69	5,144,546
0002	Arrastra Mountain	11,377,131	2,559,384 3,199	921,600 1,152	62,400 78	208,800 261	10,184,331
0003	Artillery Range	30,954,364	6,332,000 7,915	1,253,600 1,567	81,600 102	212,800 266	29,406,364
0005	Bagdad	11,984,369	2,860,673 3,576	896,000 1,120	48,000 60	300,000 375	10,740,369
0006	Bateman Spring	7,023,282	1,668,697 2,086	220,800 276	0 0	96,000 120	6,706,482
0008	Big Sandy	31,045,469	8,752,183 10,940	2,440,800 3,051	0 0	878,400 1,098	27,726,269
0009	Black Mesa	3,896,025	965,943 1,207	261,600 327	4,800 6	110,400 138	3,519,225
0011	Boriana	22,819,953	6,690,054 8,363	2,198,400 2,748	0 0	676,800 846	19,944,753
0012	Bottleneck Wash	94,671	36,116 45	8,800 11	0 0	9,600 12	76,271
0013	Burro Creek	4,289,488	1,084,609 1,356	205,600 257	0 0	98,400 123	3,985,488
0014	Burro Creek Ranch	16,893,562	4,473,300 5,592	826,400 1,033	48,000 60	311,200 389	15,707,962
0116	Byner	1,977,816	434,899 544	130,400 163	0 0	52,800 66	1,794,616
0016	Cane Springs Wash	632,230	141,940 177	48,000 60	0 0	42,400 53	541,830
0021	Chicken Springs	43,474,748	9,597,269 11,997	2,544,800 3,181	0 0	524,800 656	40,405,148
0022	Chino Springs	8,033,760	1,686,785 2,108	0 0	38,400 48	80,800 101	7,914,560
0028	Diamond Joe	10,808,710	2,145,707 2,682	573,600 717	0 0	503,200 629	9,731,910
0031	DOR	548,238	68,947 86	0 0	0 0	4,800 6	543,438
0033	Fancher Mountain	1,494,405	404,433 506	163,200 204	0 0	31,200 39	1,300,005
0035	Francis Creek	37,753,930	12,288,015 15,360	6,316,000 7,895	230,400 288	661,600 827	30,545,930
0103	Gibson	7,761,331	1,370,828 1,714	148,800 186	0 0	67,200 84	7,545,331
0038	Gray Wash	3,638,944	1,007,922 1,260	184,000 230	0 0	64,800 81	3,390,144
0039	Greenwood Community	7,260,320	1,665,767 2,082	200,800 251	38,400 48	76,800 96	6,944,320
0040	Greenwood Pk. Community	13,389,249	3,387,530 4,234	479,200 599	43,200 54	234,400 293	12,632,449
0041	Groom Peak	2,607,564	760,888 951	179,200 224	0 0	120,000 150	2,308,364
0043	Happy Jack Wash	9,294,964	1,886,846 2,359	324,800 406	0 0	26,400 33	8,943,764
0046	Hot Springs	429,328	82,143 103	4,000 5	0 0	14,400 18	410,928
0047	Hualapai Peak	4,804,542	879,227 1,099	81,600 102	0	247,200 309	4,475,742
2105	JJJ	212,100	33,918 42	0 0	0 0	7,200 9	204,900
0049	Kayser Wash	215,810	51,978 65	19,200 24	0 0	7,200 9	189,410
0107	Kellis	698,654	145,905 182	31,200 39	0 0	57,600 72	609,854
0050	Kent's Cane Spring	12,852,527	3,196,100 3,995	1,098,400 1,373	0 0	410,400 513	11,343,727
0051	La Cienega	36,696,880	7,927,541 9,909	1,562,400 1,953	0 0	314,400 393	34,820,080
0052	Lazy Yu	6,844,216	1,389,952 1,737	452,000 565	0 0	228,000 285	6,164,216
0110	Lines	6,594,970	1,783,927 2,230	488,000 610	0 0	122,400 153	5,984,570
0083	Little Cane	2,161,085	541,608 677	81,600 102	0 0	172,800 216	1,906,685
0054	Los Molinos	9,191,125	2,163,537 2,704	636,000 795	0 0	421,600 527	8,133,525
0111	McElhaney	6,249,912	1,455,460 1,819	599,200 749	0 0	210,400 263	5,440,312
0063	Round Valley	318,385	56,953 71	11,200 14	0 0	9,600 12	297,585
0064	Sandy	573,492	44,782 56	27,200 34	0 0	47,200 59	499,092
0115	Sweetmilk	2,461,432	577,053 721	232,000 290	0 0	104,800 131	2,124,632
0069	Trout Creek	264,260	54,854 69	20,000 25	0 0	4,800 6	239,460
0073	Walnut Creek	44,689,876	10,616,844 13,271	2,210,400 2,763	0 0	1,192,000 1,490	41,287,476
0075	White Spring	560,254	129,144 161	35,200 44	0 0	28,800 36	496,254
0076	Wikieup	4,561,505	1,140,245 1,425	220,000 275	0 0	88,800 111	4,252,705
0078	Yellow Pine	16,929,066	3,890,868 4,864	980,800 1,226	0 0	631,200 789	15,317,066
	TOTALS	451,635,688	109,393,171 136,741	29,316,800 36,646	667,200 834	9,769,600 12,212	411,882,088

APPENDIX 2-3 (Continued)
PROJECTED VEGETATION PRODUCTION AND ALLOCATION

Wildlife Enhancement

	Allotment	Total Vegetation Production (lbs)	Total Usable Forage Production[2] (lbs / AUMs)	Projected Allocation (lbs / AUMs) Livestock	Burros	Big Game[3,6]	Other Resources[7] (lbs)
0001	Alamo Crossing	5,271,746	961,600 1,202	0 0	72,000 90	55,200 69	5,144,546
0002	Arrastra Mountain	11,607,706	2,789,959 3,487	961,626 1,202	62,400 78	255,726 320	10,327,954
0003	Artillery Range	31,626,142	7,004,000 8,755	1,351,200 1,689	81,600 102	244,750 306	29,948,592
0005	Bagdad	12,144,782	3,021,086 3,776	885,452 1,107	48,000 60	340,877 426	10,870,453
0006	Bateman Spring	7,205,021	1,850,436 2,313	236,544 296	0 0	107,520 134	6,860,957
0008	Big Sandy	31,905,058	9,611,772 12,015	2,428,480 3,036	0 0	1,080,432 1,351	28,396,146
0009	Black Mesa	4,009,665	1,079,583 1,349	276,658 346	4,800 6	126,094 158	3,602,113
0011	Boriana	22,990,039	6,860,140 8,575	2,084,976 2,606	0 0	818,928 1,024	20,086,135
0012	Bottleneck Wash	94,671	36,116 45	8,000 10	0 0	9,600 12	77,071
0013	Burro Creek	4,359,787	1,154,908 1,444	0 0	0 0	113,160 142	4,246,627
0014	Burro Creek Ranch	17,253,024	4,832,762 6,041	954,810 1,194	48,000 60	380,446 476	15,869,768
0116	Byner	1,977,816	434,899 544	111,784 140	0 0	46,992 59	1,819,040
0016	Cane Springs Wash	632,230	141,940 177	42,432 53	0 0	44,096 56	545,702
0021	Chicken Springs	44,274,522	10,397,041 12,996	2,576,296 3,220	0 0	614,016 768	41,084,210
0022	Chino Springs	8,033,760	1,686,785 2,108	0 0	38,400 48	80,800 101	7,914,560
0028	Diamond Joe	10,888,181	2,225,178 2,781	744,800 931	0 0	563,584 704	9,579,797
0031	DOR	548,238	68,947 86	0 0	0 0	4,800 6	543,438
0033	Fancher Mountain	1,494,405	404,433 506	180,800 226	0 0	30,576 38	1,283,029
0035	Francis Creek	38,905,932	13,440,017 16,800	6,414,300 8,018	230,400 288	938,340 1,173	31,322,892
0103	Gibson	7,949,484	1,558,981 1,949	188,000 235	0 0	77,280 97	7,684,204
0038	Gray Wash	3,694,940	1,063,918 1,330	207,888 260	0 0	73,872 92	3,413,180
0039	Greenwood Community	7,462,231	1,867,678 2,335	324,800 406	38,400 48	86,503 108	7,012,528
0040	Greenwood Pk. Community	13,740,785	3,739,066 4,674	470,648 588	43,200 54	277,184 347	12,949,753
0041	Groom Peak	2,620,683	774,007 968	183,056 229	0 0	141,600 177	2,296,027
0043	Happy Jack Wash	9,370,438	1,962,320 2,453	413,152 516	0 0	27,456 34	8,929,830
0046	Hot Springs	429,328	82,143 103	4,000 5	0 0	14,400 18	410,928
0047	Hualapai Peak	4,811,869	886,554 1,109	70,288 88	0 0	299,112 374	4,442,469
2105	JJJ	212,100	33,918 42	0 0	0 0	7,200 9	204,900
0049	Kayser Wash	215,810	51,978 65	17,400 22	0 0	6,264 8	192,146
0107	Kellis	698,654	145,905 182	27,520 34	0 0	49,536 62	621,598
0050	Kent's Cane Spring	12,852,527	3,196,100 3,995	1,043,968 1,305	0 0	500,688 626	11,307,871
0051	La Cienega	37,764,049	8,994,710 11,243	1,638,352 2,048	0 0	370,992 464	35,754,705
0052	Lazy Yu	7,003,068	1,548,804 1,936	455,920 570	0 0	266,760 334	6,280,388
0110	Lines	6,610,349	1,799,306 2,249	441,368 552	0 0	143,208 179	6,025,773
0083	Little Cane	2,161,085	541,608 627	71,712 90	0 0	186,624 233	1,902,749
0054	Los Molinos	9,368,142	2,340,554 2,926	612,632 766	0 0	501,704 627	8,253,806
0111	McElhaney	6,414,681	1,620,229 2,025	588,112 735	0 0	248,272 310	5,578,297
0063	Round Valley	318,385	56,953 71	12,800 16	0 0	8,928 11	296,657
0064	Sandy	573,492	44,782 56	24,960 31	0 0	49,088 61	499,444
0115	Sweetmilk	2,461,432	577,053 721	205,616 257	0 0	74,408 93	2,181,408
0069	Trout Creek	264,260	54,854 69	17,800 22	0 0	4,272 5	242,188
0073	Walnut Creek	45,155,527	11,082,495 13,853	2,081,752 2,602	0 0	1,418,480 1,773	41,655,295
0075	White Spring	560,254	129,144 161	31,360 39	0 0	28,224 36	500,670
0076	Wikieup	4,615,803	1,194,543 1,493	346,080 433	0 0	97,680 122	4,172,043
0078	Yellow Pine	17,777,983	4,739,785 5,925	1,077,360 1,347	0 0	845,808 1,057	15,854,815
	TOTALS	460,330,083	118,088,365 147,611	29,814,702 37,268	667,200 834	11,661,480 14,577	418,186,701

APPENDIX 2-3 (Continued)
PROJECTED VEGETATION PRODUCTION AND ALLOCATION

Elimination of Livestock Grazing

	Allotment	Total Vegetation Production (lbs)	Total Usable Forage Production[2] (lbs / AUMs)	Projected Allocation (lbs / AUMs) Livestock	Burros	Big Game[3,4]	Other Resources[7] (lbs)
0001	Alamo Crossing	5,271,746	961,600 1,202	0 0	72,000 90	55,200 69	5,144,546
0002	Arrastra Mountain	11,238,786	2,421,039 3,026	0 0	192,000 240	208,800 261	10,837,986
0003	Artillery Range	30,771,152	6,148,800 7,686	0 0	259,200 324	212,800 266	30,299,152
0005	Bagdad	11,957,636	2,833,939 3,542	0 0	321,600 402	300,000 375	11,336,036
0006	Bateman Spring	7,039,804	1,685,219 2,107	0 0	0 0	96,000 120	6,943,804
0008	Big Sandy	30,654,746	8,361,460 10,452	0 0	0 0	878,400 1,098	29,776,346
0009	Black Mesa	3,896,025	965,943 1,207	0 0	19,200 24	110,400 138	3,766,425
0011	Boriana	22,649,867	6,519,968 8,150	0 0	0 0	676,800 846	21,973,067
0012	Bottleneck Wash	94,671	36,116 45	0 0	0 0	9,600 12	85,071
0013	Burro Creek	4,359,787	1,154,908 1,444	0 0	0 0	98,400 123	4,261,387
0014	Burro Creek Ranch	16,653,921	4,233,659 5,292	0 0	172,800 216	311,200 389	16,169,921
0016	Byner	2,080,432	537,515 672	0 0	0 0	52,800 66	2,027,632
0016	Cane Springs Wash	636,325	146,035 183	0 0	0 0	42,400 53	593,925
0021	Chicken Springs	43,208,159	9,330,678 11,663	0 0	0 0	524,800 656	42,683,359
0022	Chino Springs	8,033,760	1,686,785 2,108	0 0	120,000 150	80,800 101	7,832,960
0028	Diamond Joe	10,749,107	2,086,104 2,608	0 0	0 0	503,200 629	10,245,907
0031	DOR	548,238	68,947 86	0 0	0 0	4,800 6	543,438
0033	Fancher Mountain	1,568,689	478,717 598	0 0	0 0	31,200 39	1,537,489
0035	Francis Creek	37,465,928	12,000,015 15,000	0 0	720,000 900	661,600 827	36,084,328
0103	Gibson	7,747,892	1,357,389 1,697	0 0	0 0	67,200 84	7,680,692
0038	Gray Wash	3,629,611	998,589 1,248	0 0	0 0	64,800 81	3,564,811
0039	Greenwood Community	7,277,146	1,682,593 2,103	0 0	120,000 150	76,800 96	7,080,346
0040	Greenwood Pk. Community	13,229,459	3,227,740 4,035	0 0	321,600 402	234,400 293	12,673,459
0041	Groom Peak	2,502,614	655,938 820	0 0	0 0	120,000 150	2,382,614
0043	Happy Jack Wash	9,294,964	1,886,846 2,359	0 0	0 0	26,400 33	9,268,564
0046	Hot Springs	429,328	82,143 103	0 0	0 0	14,400 18	414,928
0047	Hualapai Peak	4,709,292	783,977 980	0 0	0 0	247,200 309	4,462,092
2105	JJJ	216,170	37,988 47	0 0	0 0	7,200 9	208,970
0049	Kayser Wash	223,577	59,745 75	0 0	0 0	7,200 9	216,377
0107	Kellis	747,855	195,106 244	0 0	0 0	57,600 72	690,255
0050	Kent's Cane Spring	12,564,354	2,907,927 3,634	0 0	0 0	410,400 513	12,153,954
0051	La Cienega	36,696,880	7,927,541 9,909	0 0	0 0	314,400 393	36,382,480
0052	Lazy Yu	6,857,454	1,403,190 1,754	0 0	0 0	228,000 285	6,629,454
0110	Lines	6,364,290	1,553,247 1,942	0 0	0 0	122,400 153	6,241,890
0083	Little Cane	2,120,966	501,489 627	0 0	0 0	172,800 216	1,948,166
0054	Los Molinos	9,191,125	2,163,537 2,704	0 0	0 0	421,600 527	8,769,525
0111	McElhaney	6,249,912	1,455,460 1,819	0 0	0 0	210,400 263	6,039,512
0063	Round Valley	322,672	61,240 77	0 0	0 0	9,600 12	313,072
0064	Sandy	572,631	43,921 55	0 0	0 0	47,200 59	525,431
0115	Sweetmilk	2,697,130	812,751 1,016	0 0	0 0	104,800 131	2,592,330
0069	Trout Creek	271,040	61,634 77	0 0	0 0	4,800 6	266,240
0073	Walnut Creek	44,317,355	10,244,323 12,805	0 0	0 0	1,192,000 1,490	43,125,355
0075	White Spring	566,843	135,733 170	0 0	0 0	28,800 36	538,043
0076	Wikieup	4,583,224	1,161,964 1,452	0 0	0 0	88,800 111	4,494,424
0078	Yellow Pine	16,575,351	3,537,153 4,421	0 0	0 0	631,200 789	15,944,151
	TOTALS	448,837,914	106,596,196 133,245	0 0	2,318,400 2,898	9,769,600 12,212	436,749,914

APPENDIX 2-4
ALLOTMENT ACREAGE SUMMARY

Allotment		Acres Federal	State Leased by Allottee	Private Owned or Leased by Allottee	Unowned and Unleased by Allottee
Alamo Crossing		20,910	0	0	2,430
Arrastra Mountain		24,767	177	640	161
Artillery Range		71,853	1,259	1,332	14,037
Bagdad		25,296	11,909	2,493	52
Bateman Springs		17,786	1,353	30	7,435
Big Sandy		56,643	5,002	9,930	16,831
Black Mesa		6,968	686	0	0
Boriana	'A'	28,786	0	1,719	8,920
	'B'	9,919	0	1,491	1,280
Bottleneck Wash		134	--	--	--
Burro Creek		4,819	1,242	0	0
Burro Creek Ranch		34,588	0	4,075	0
Byner		3,727	--	--	--
Cane Springs Wash	'A'	1,400	0	0	0
	'B'	120	--	--	--
Chicken Springs		84,434	2,531	43,146	7,075
Chino Springs		19,146	0	0	0
Diamond Joe		16,249	0	4,439	2,245
DOR		1,078	0	313	1,149
Fancher Mountain		3,150	--	--	--
Francis Creek		50,957	15,421	29,589	14,474
Gibson		17,565	10,107	2,122	3,636
Gray Wash		8,555	0	4,754	3,667
Greenwood		16,472	0	156	6,553
Greenwood Peak		32,944	629	0	14,692
Groom Peak		5,276	0	1,455	340
Happy Jack Wash		25,534	0	47	15,902
Hot Springs		1,062	0	135	61
Hualapai Peak		5,302	1,201	5,226	1,281
JJJ		303	--	--	--
Kayser Wash		640	--	--	--
Kellis		1,467	--	--	--
Kent's Cane Spring	'A'	14,143	3,436	13,223	80
	'B'	1,335	--	--	--
La Cienega		71,303	14,219	78,706	3,368
Lazy Yu	'A'	12,370	0	6,464	2,709
	'B'	1,940	--	--	--
Lines		14,222	7,920	475	446
Little Cane		5,718	0	320	0
Los Molinos		17,551	0	1,118	967
McElhaney		9,180	0	0	0
Round Valley		640	--	--	--
Sandy	'A'	600	0	10	0
	'B'	541	--	--	--
Sweetmilk		3,650	--	--	--
Trout Creek		640	--	--	--
Walnut Creek		73,406	0	9,123	2,062
White Spring		1,385	--	--	--
Wikieup		8,363	643	1,744	220
Yellow Pine	'A'	21,358	1,120	15,644	992
	'B'	554	--	--	--
TOTALS		856,749	78,855	239,919	133,065

NOTE: Allotments whose acreage is marked by a -- are proposed for nonintensive management. For these allotments only the Federal acreage is known.

APPENDIX 2-5

RANGELAND DEVELOPMENT SUMMARY BY ALLOTMENT

Proposed Action

Allotment	Development Type	Unit	Approximate Cost (1981 Dollars)	Acres Disturbed		Construction Year (After Filing of Final EIS)
				Short Term	Long Term	
Alamo Crossing	Well	3	$ 39,000	0.75	0.23	5
	Fence	8 mi	36,000	4.0	0.8	
	Trough	3	825	1.5	1.5	
Arrastra Mountain	Catchment	1	20,000	1.5	1.2	2
	Spring Development	2	2,000	0.5	0.18	
	Well	1	13,000	0.25	0.08	
	Pipeline	5 mi	42,500	5.0	1.67	
	Fence	10 mi	45,000	5.0	1.0	
	Cattleguard	1	3,150	0.1	0.1	
	Trough	6	1,650	3.0	3.0	
Artillery Range	Reservoir	1	5,500	2.0	1.6	3
	Catchment	2	40,000	3.0	2.4	
	Spring Development	2	2,000	0.5	0.18	
	Pipeline	6 mi	51,000	6.0	2.0	
	Fence	27 mi	121,500	13.5	2.7	
	Cattleguard	2	6,300	0.2	0.2	
	Trough	8	2,200	4.0	4.0	
Bagdad	Catchment	2	40,000	3.0	2.4	5
	Spring Development	4	4,000	1.0	0.35	
	Pipeline	5 mi	42,500	5.0	1.65	
	Fence	14 mi	63,000	7.0	1.4	
	Cattleguard	2	6,300	0.2	0.2	
	Trough	8	2,200	4.0	4.0	
Bateman Spring	Well	1	13,000	0.25	.08	2
	Pipeline	2 mi	17,000	2.0	.66	
	Trough	2	550	1.0	1.0	
Big Sandy	Spring Development	8	$ 8,000	2.0	0.7	3
	Well	2	26,000	0.5	0.15	
	Pipeline	10 mi	85,000	10.0	3.33	
	Fence	17 mi	76,500	8.5	1.7	
	Cattleguard	3	9,450	0.3	0.3	
	Trough	15	4,125	7.5	7.5	
Black Mesa	Well	1	13,000	0.25	0.08	2
	Fence	1 mi	4,500	0.5	0.1	
	Trough	1	275	0.5	0.5	
Boriana 'A'	Spring Development	8	8,000	2.0	0.7	4
	Pipeline	10 mi	85,000	10.0	3.33	
	Fence	8 mi	36,000	4.0	0.8	
	Cattleguard	2	6,300	0.2	0.2	
	Trough	13	3,575	6.5	6.5	
Boriana 'B'	--	--	--	--	--	--
Bottleneck Wash	--	--	--	--	--	--
Burro Creek	Fence	3 mi	13,500	1.5	0.3	1
Burro Creek Ranch	Catchment	1	20,000	1.5	1.2	1
	Spring Development	6	6,000	1.5	0.53	
	Pipeline	6 mi	51,000	6.0	2.0	
	Fence	10 mi	45,000	5.0	1.0	
	Cattleguard	3	9,450	0.3	0.3	
	Trough	10	2,750	5.0	5.0	
Byner	--	--	--	--	--	--
Cane Springs Wash 'A'	--	--	--	--	--	--
Cane Springs Wash 'B'	--	--	--	--	--	--
Chicken Springs	Catchment	3	$ 60,000	4.5	3.6	2
	Spring Development	6	6,000	1.5	0.53	
	Well	3	39,000	0.75	0.23	
	Pipeline	13 mi	110,500	13.0	4.3	
	Fence	12 mi	54,000	6.0	1.2	
	Cattleguard	2	6,300	0.2	0.2	
	Trough	18	4,950	9.0	9.0	

RANGELAND DEVELOPMENT SUMMARY BY ALLOTMENT

Proposed Action (Continued)

Allotment	Development Type	Unit	Approximate Cost (1981 Dollars)	Acres Disturbed		Construction Year (After Filing of Final EIS)
				Short Term	Long Term	
Chino Springs	Catchment	1	20,000	1.5	1.2	5
	Spring Development	1	1,000	0.25	0.09	
	Trough	2	550	1.0	1.0	
Diamond Joe	Spring Development	4	4,000	1.0	0.35	3
	Pipeline	4 mi	34,000	4.0	1.33	
	Fence	3 mi	13,500	1.5	0.3	
	Trough	6	1,650	3.0	3.0	
DOR Ranch	--	--	--	--	--	--
Fancher Mountain	--	--	--	--	--	--
Francis Creek	Reservoir	2	11,000	4.0	3.2	5
	Catchment	2	40,000	3.0	2.4	
	Spring Development	10	10,000	2.5	0.88	
	Pipeline	5 mi	42,500	5.0	1.67	
	Fence	20 mi	90,000	10.0	2.0	
	Cattleguard	4	12,600	0.4	0.4	
	Trough	16	4,400	8.0	8.0	
Gibson	Spring Development	3	3,000	0.75	0.27	3
	Well	1	13,000	0.25	0.08	
	Trough	4	1,100	2.0	2.0	
Gray Wash	Spring Development	4	$ 4,000	1.0	.35	1
	Pipeline	4 mi	34,000	4.0	1.33	
	Fence	8 mi	36,000	4.0	0.8	
	Cattleguard	1	3,150	0.1	0.1	
	Trough	6	1,650	3.0	3.0	
Greenwood Community	Spring Development	2	2,000	0.5	0.18	3
	Well	1	13,000	0.25	0.08	
	Pipeline	1 mi	8,500	1.0	0.33	
	Fence	9 mi	40,500	4.5	0.9	
	Trough	4	1,100	2.0	2.0	
Greenwood Pk. Community	Catchment	1	20,000	1.5	1.2	1
	Spring Development	8	8,000	2.0	0.7	
	Pipeline	4 mi	34,000	4.0	1.3	
	Fence	9 mi	40,500	4.5	0.9	
	Cattleguard	3	9,450	0.3	0.3	
	Trough	11	3,025	5.5	5.5	
Groom Peak	Spring Development	1	1,000	0.25	0.09	4
	Well	1	13,000	0.25	0.08	
	Pipeline	1 mi	8,500	1.0	0.33	
	Fence	5 mi	22,500	2.5	0.5	
	Trough	3	825	1.5	1.5	
Happy Jack Wash	Catchment	1	20,000	1.5	1.2	4
	Well	2	26,000	0.5	0.15	
	Pipeline	1 mi	8,500	1.0	0.33	
	Fence	5 mi	22,500	2.5	0.5	
	Cattleguard	2	6,300	0.2	0.2	
	Trough	4	1,100	2.0	2.0	
Hot Springs	--	--	--	--	--	--
Hualapai Peak	Spring Development	3	$ 3,000	0.75	0.26	2
	Pipeline	2 mi	17,000	2.0	0.66	
	Fence	5 mi	22,500	2.5	0.5	
	Cattleguard	1	3,150	0.1	0.1	
	Trough	4	1,100	2.0	2.0	
JJJ	--	--	--	--	--	--
Kayser Wash	--	--	--	--	--	--
Kellis	--	--	--	--	--	--

RANGELAND DEVELOPMENT SUMMARY BY ALLOTMENT

Proposed Action (Continued)

Allotment		Development Type	Unit	Approximate Cost (1981 Dollars)	Acres Disturbed		Construction Year (After Filing of Final EIS)
					Short Term	Long Term	
Kent's Cane Spring	'A'	Stock Trail	4 mi	4,000	4.0	0.4	5
		Catchment	2	40,000	3.0	2.4	
		Spring Development	4	4,000	1.0	0.35	
		Fence	7 mi	31,500	3.5	0.7	
		Trough	6	1,650	3.0	3.0	
Kent's Cane Spring	'B'	--	--	--	--	--	--
La Cienega		Reservoir	2	11,000	4.0	3.2	3
		Catchment	2	40,000	3.0	2.4	
		Spring Development	10	10,000	2.5	0.8	
		Well	2	26,000	0.5	0.15	
		Pipeline	10 mi	85,000	10.0	3.33	
		Fence	25 mi	112,500	12.5	2.5	
		Cattleguard	2	6,300	0.2	0.2	
		Stock Trail	4 mi	4,000	4.0	0.4	
		Trough	17	4,675	8.5	8.5	
Lazy YU	'A'	Spring Development	4	4,000	1.0	0.35	4
		Pipeline	4 mi	34,000	4.0	1.33	
		Fence	7 mi	31,500	3.5	0.7	
		Cattleguard	2	6,300	0.2	0.2	
		Trough	6	1,650	3.0	3.0	
Lazy YU	'B'	--	--	--	--	--	--
Lines		Catchment	2	$ 40,000	3.0	2.4	2
		Spring Development	1	1,000	0.25	0.09	
		Fence	10 mi	45,000	5.0	1.0	
		Cattleguard	3	9,450	0.3	0.3	
		Trough	3	825	1.5	1.5	
Little Cane		Reservoir	1	5,500	2.0	1.6	5
		Trough	1	275	0.5	0.5	
Los Molinos		Catchment	1	20,000	1.5	1.2	4
		Spring Development	3	3,000	0.75	0.25	
		Pipeline	2 mi	17,000	2.0	0.67	
		Trough	5	1,375	2.5	2.5	
McElhaney		Reservoir	1	5,500	2.0	1.6	5
		Catchment	1	20,000	1.5	1.2	
		Fence	5 mi	22,500	2.5	0.5	
		Trough	2	550	1.0	1.0	
Round Valley		--	--	--	--	--	--
Sandy	'A'	--	--	--	--	--	--
Sandy	'B'	--	--	--	--	--	--
Sweetmilk		--	--	--	--	--	--
Trout Creek		--	--	--	--	--	--
Walnut Creek		Reservoir	4	22,000	8.0	6.4	1
		Spring Development	6	6,000	1.5	0.5	
		Pipeline	15 mi	127,500	15.0	5.0	
		Fence	30 mi	135,000	15.0	3.0	
		Cattleguard	4	12,600	0.4	0.4	
		Trough	17	4,675	8.5	8.5	
White Spring		--	--	--	--	--	--
Wikieup		Spring Development	1	$ 1,000	0.25	0.09	4
		Well	1	13,000	0.25	0.08	
		Pipeline	2 mi	17,000	2.0	0.67	
		Trough	3	825	1.5	1.5	
Yellow Pine	'A'	Spring Development	5	5,000	1.25	0.44	1
		Fence	8 mi	36,000	4.0	0.8	
		Trough	5	1,375	2.5	2.5	
Yellow Pine	'B'	--	--	--	--	--	--

APPENDIX 2-5 (Continued)
RANGELAND DEVELOPMENT SUMMARY BY ALLOTMENT

Continuation of Present Management and Moderate Grazing Management

Allotment	Development Type	Unit	Approximate Cost (1981 Dollars)	Acres Disturbed		Construction Year (After Filing of Final EIS)[1]
				Short Term	Long Term	
Alamo Crossing	Well	1	13,000	0.25	0.08	5
	Trough	5	1,375	2.5	2.5	
	Fence	8 mi	36,000	4.0	0.8	
Arrastra Mountain	Catchment	1	20,000	1.5	1.2	2
	Spring Development	2	2,000	0.5	0.18	
	Well	1	13,000	0.25	0.08	
	Pipeline	1 mi	8,500	1.0	0.33	
	Trough	4	1,100	2.0	2.0	
	Fence	11 mi	49,500	5.5	1.1	
Artillery Range	Catchment	1	20,000	1.5	1.2	3
	Reservoir	1	5,500	2.0	1.6	
	Spring Development	2	2,000	0.5	0.18	
	Pipeline	1 mi	8,500	1.0	0.33	
	Fence	17 mi	76,500	8.5	1.7	
	Cattleguard	2	6,300	0.2	0.2	
	Trough	4	1,100	2.0	2.0	
Bagdad	Catchment	1	20,000	1.5	1.2	5
	Spring Development	4	4,000	1.0	0.35	
	Pipeline	1 mi	8,500	1.0	0.33	
	Fence	6 mi	27,000	3.0	0.6	
	Cattleguard	2	6,300	0.2	0.2	
	Trough	5	1,375	2.5	2.5	
Bateman Spring	Well	1	13,000	0.25	.08	2
	Pipeline	2 mi	17,000	2.0	.67	
	Trough	2	550	1.0	1.0	
Big Sandy	Spring Development	4	$ 4,000	1.0	0.35	3
	Well	1	13,000	0.25	0.08	
	Pipeline	2 mi	17,000	2.0	0.67	
	Trough	6	1,650	3.0	3.0	
	Fence	17 mi	76,500	8.5	1.7	
	Cattleguard	3	9,450	0.3	0.3	
Black Mesa	Well	1	13,000	0.25	0.08	2
	Trough	1	275	0.5	0.5	
	Fence	1 mi	4,500	0.5	0.1	
Boriana 'A'	Spring Development	4	4,000	1.0	0.35	4
	Pipeline	5 mi	42,500	5.0	1.67	
	Trough	7	1,925	3.5	3.5	
	Fence	4 mi	18,000	2.0	0.4	
Boriana 'B'	--	--	--	--	--	--
Bottleneck Wash	--	--	--	--	--	--
Burro Creek	Fence	3 mi	13,500	1.5	0.3	1
Burro Creek Ranch	Catchment	1	20,000	1.5	1.2	1
	Spring Development	3	3,000	0.75	0.26	
	Pipeline	2 mi	17,000	2.0	0.67	
	Trough	5	1,375	2.5	2.5	
	Fence	2 mi	9,000	1.0	0.2	
Byner	--	--	--	--	--	--
Cane Springs Wash 'A'	--	--	--	--	--	--
Cane Springs Wash 'B'	--	--	--	--	--	--
Chicken Springs	Catchment	1	$ 20,000	1.5	1.2	2
	Spring Development	3	3,000	0.75	0.26	
	Well	1	13,000	0.25	0.08	
	Pipeline	4 mi	34,000	4.0	1.33	
	Trough	7	1,925	3.5	3.5	

APPENDIX 2-5 (Continued)
RANGELAND DEVELOPMENT SUMMARY BY ALLOTMENT

Continuation of Present Management and Moderate Grazing Management (Continued)

Allotment		Development Type	Unit	Approximate Cost (1981 Dollars)	Acres Disturbed		Construction Year (After Filing of Final EIS)[1]
					Short Term	Long Term	
La Cienega		Reservoir	1	5,500	2.0	1.6	3
		Catchment	1	20,000	1.5	1.2	
		Spring Development	5	5,000	1.25	0.44	
		Well	1	13,000	0.25	0.08	
		Pipeline	5 mi	42,500	5.0	1.65	
		Trough	10	2,750	5.0	5.0	
		Fence	5 mi	22,500	2.5	0.5	
Lazy YU	'A'	Spring Development	2	2,000	0.5	0.18	4
		Pipeline	1 mi	8,500	1.0	0.33	
		Trough	2	550	1.0	1.0	
		Fence	4 mi	18,000	2.0	0.4	
		Cattleguard	1	3,150	0.1	0.1	
Lazy YU	'B'	--	--	--	--	--	--
Lines		Catchment	1	$ 20,000	1.5	1.2	2
		Spring Development	1	1,000	0.25	0.09	
		Trough	2	550	1.0	1.0	
Little Cane		Reservoir	1	5,500	2.0	1.6	5
		Trough	1	275	0.5	0.5	
Los Molinos		Catchment	1	20,000	1.5	1.2	4
		Spring Development	1	1,000	0.25	0.09	
		Pipeline	1 mi	8,500	1.0	0.33	
		Trough	2	550	1.0	1.0	
McElhaney		Reservoir	1	5,500	2.0	1.6	5
		Trough	1	275	0.5	0.5	
		Fence	5 mi	22,500	2.5	0.5	
Round Valley		--	--	--	--	--	--
Sandy	'A'	--	--	--	--	--	--
Sandy	'B'	--	--	--	--	--	--
Sweetmilk		--	--	--	--	--	--
Trout Creek		--	--	--	--	--	--
Walnut Creek		Reservoir	2	11,000	4.0	3.2	1
		Spring Development	3	3,000	0.75	0.27	
		Pipeline	5 mi	42,500	5.0	1.65	
		Trough	7	1,925	3.5	3.5	
		Fence	6 mi	27,000	3.0	0.6	
White Spring		--	--	--	--	--	--
Wikieup		Spring Development	1	$ 1,000	0.25	0.09	4
		Pipeline	1 mi	8,500	1.0	0.33	
		Trough	1	275	0.5	0.5	
Yellow Pine	'A'	Spring Development	2	2,000	0.5	0.18	1
		Trough	2	550	1.0	1.0	
		Fence	2 mi	9,000	1.0	0.2	
Yellow Pine	'B'	--	--	--	--	--	--

[1] Construction schedule applies to moderate management alternative only. Under Continuation of present management, construction of developments would be spread over a 20-year period.

APPENDIX 2-5 (Continued)
RANGELAND DEVELOPMENT SUMMARY BY ALLOTMENT

Continuation of Present Management and Moderate Grazing Management (Continued)

Allotment	Development Type	Unit	Approximate Cost (1981 Dollars)	Acres Disturbed		Construction Year (After Filing of Final EIS)[1]
				Short Term	Long Term	
Chino Springs	Catchment	1	20,000	1.5	1.2	5
	Spring Development	1	1,000	0.25	0.09	
	Trough	2	550	1.0	1.0	
Diamond Joe	Spring Development	2	2,000	0.5	0.18	3
	Pipeline	1 mi	8,500	1.0	0.33	
	Troughs	2	550	1.0	1.0	
DOR Ranch	--	--	--	--	--	--
Fancher Mountain	--	--	--	--	--	--
Francis Creek	Reservoir	1	5,500	2.0	1.6	5
	Catchment	1	20,000	1.5	1.2	
	Spring Development	5	5,000	1.25	0.44	
	Pipeline	2 mi	17,000	2.0	0.67	
	Trough	8	2,200	4.0	4.0	
	Fence	10 mi	45,000	5.0	1.0	
	Cattleguard	2	6,300	0.2	0.2	
Gibson	Spring Development	1	1,000	0.25	0.09	3
	Well	1	13,000	0.25	0.08	
	Trough	2	550	1.0	1.0	
Gray Wash	Spring Development	1	$ 1,000	0.25	.09	1
	Trough	1	275	0.5	0.5	
	Fence	8 mi	36,000	4.0	0.8	
Greenwood Community	Spring Development	1	1,000	0.25	0.09	3
	Trough	1	275	0.5	0.5	
	Fence	6 mi	27,000	3.0	0.6	
Greenwood Pk. Community	Catchment	1	20,000	1.5	1.2	1
	Spring Development	4	4,000	1.0	0.35	
	Pipeline	2 mi	17,000	2.0	0.67	
	Troughs	6	1,650	3.0	3.0	
Groom Peak	Spring Development	1	1,000	0.25	0.09	4
	Trough	1	275	0.5	0.5	
	Fence	5 mi	22,500	2.5	0.5	
Happy Jack Wash	Catchment	1	20,000	1.5	1.2	4
	Well	1	13,000	0.25	0.08	
	Trough	2	550	1.0	1.0	
	Cattleguard	2	6,300	0.2	0.2	
Hot Springs	--	--	--	--	--	--
Hualapai Peak	Spring Development	1	$ 1,000	0.25	0.08	2
	Trough	1	275	0.5	0.5	
	Fence	5 mi	22,500	2.5	0.5	
	Cattleguard	1	3,150	0.1	0.1	
JJJ	--	--	--	--	--	--
Kayser Wash	--	--	--	--	--	--
Kellis	--	--	--	--	--	--
Kent's Cane Spring 'A'	Catchment	1	20,000	1.5	1.2	5
	Spring Development	2	2,000	0.5	0.18	
	Trough	3	825	1.5	1.5	
	Fence	4 mi	18,000	2.0	0.4	
Kent's Cane Spring 'B'	--	--	--	--	--	--

APPENDIX 2-5 (Continued)
RANGELAND DEVELOPMENT SUMMARY BY ALLOTMENT

Wildlife Enhancement

Allotment	Development Type	Unit	Approximate Cost (1981 Dollars)	Acres Disturbed		Construction Year (After Filing of Final EIS)
				Short Term	Long Term	
Alamo Crossing	Well	3	$ 39,000	0.75	0.23	4
	Fence	17 mi	76,500	8.5	1.7	
	Trough	3	825	1.5	1.5	
Arrastra Mountain	Trough	5	1,375	2.5	2.5	2
	Catchment	1	20,000	1.5	1.2	
	Spring Development	2	2,000	0.5	0.18	
	Pipeline	3 mi	25,500	3.0	1.0	
	Fence	10 mi	45,000	5.0	1.0	
	Cattleguard	1	3,150	0.1	0.1	
Artillery Range	Reservoir	1	5,500	2.0	1.6	3
	Catchment	1	20,000	1.5	1.2	
	Spring Development	2	2,000	0.5	0.18	
	Pipeline	5 mi	42,500	5.0	1.67	
	Fence	5 mi	22,500	2.5	0.5	
	Cattleguard	2	6,300	0.2	0.2	
	Trough	6	1,650	3.0	3.0	
Bagdad	Catchment	2	40,000	3.0	2.4	2
	Spring Development	4	4,000	1.0	0.35	
	Pipeline	3 mi	25,500	3.0	1.0	
	Fence	19	85,500	8.0	1.6	
	Cattleguard	2	6,300	0.2	0.2	
	Trough	7	1,925	3.0	3.0	
Bateman Spring	--	--	--	--	--	--
Big Sandy	Spring Development	8	$ 8,000	2.0	0.7	3
	Well	2	26,000	0.5	0.15	
	Pipeline	10 mi	85,000	10.0	3.33	
	Fence	12 mi	64,800	6.0	1.2	
	Cattleguard	3	9,450	0.3	0.3	
	Trough	15	4,125	7.5	7.5	
Black Mesa	Well	1	13,000	0.25	0.08	2
	Fence	5 mi	22,500	2.5	0.5	
	Trough	1	275	0.5	0.5	
Boriana 'A'	Spring Development	8	8,000	2.0	0.7	4
	Pipeline	10 mi	85,000	10.0	3.33	
	Fence	8 mi	36,000	4.0	0.8	
	Cattleguard	2	6,300	0.2	0.2	
	Trough	13	3,575	6.5	6.5	
Boriana 'B'	--	--	--	--	--	--
Bottleneck Wash	--	--	--	--	--	--
Burro Creek	Fence	13 mi	58,500	6.5	1.3	1
Burro Creek Ranch	Trough	8	2,200	4.0	4.0	1
	Catchment	1	20,000	1.5	1.2	
	Spring Development	6	6,000	1.5	0.53	
	Pipeline	2 mi	17,000	2.0	0.67	
	Fence	12 mi	54,000	6.0	1.2	
	Cattleguard	3	9,450	0.3	0.3	
Byner	Fence	2 mi	9,000	1.0	0.2	3
Cane Springs Wash 'A'	--	--	--	--	--	--
Cane Springs Wash 'B'	--	--	--	--	--	--
Chicken Springs	Trough	8	$ 2,200	4.0	4.0	2
	Catchment	3	60,000	4.5	3.6	
	Spring Development	4	4,000	1.0	0.35	
	Pipeline	3 mi	25,500	3.0	1.0	
	Fence	10 mi	45,000	5.0	1.0	
	Cattleguard	2	6,300	0.2	0.2	

APPENDIX 2-5 (Continued)
RANGELAND DEVELOPMENT SUMMARY BY ALLOTMENT

Wildlife Enhancement (Continued)

Allotment	Development Type	Unit	Cost (1981 Approximate Dollars)	Acres Disturbed		Filing of Year (After Construction Final EIS)
				Short Term	Long Term	
Chino Springs	Catchment	1	20,000	1.5	1.2	3
	Spring Development	1	1,000	0.25	0.09	
	Fence	5 mi	22,500	2.5	0.5	
	Trough	1	275	0.5	0.5	
Diamond Joe	Spring Development	4	4,000	1.0	0.35	3
	Pipeline	4 mi	34,000	4.0	1.33	
	Fence	4 mi	18,000	2.0	0.4	
	Trough	6	1,650	3.0	3.0	
DOR Ranch	--	--	--	--	--	--
Fancher Mountain	--	--	--	--	--	--
Francis Creek	Reservoir	2	11,000	4.0	3.2	3
	Catchment	2	40,000	3.0	2.4	
	Spring Development	10	10,000	2.5	0.88	
	Pipeline	3 mi	25,500	3.0	1.0	
	Fence	17 mi	76,500	8.5	1.7	
	Cattleguard	4	12,600	0.4	0.4	
	Trough	16	4,400	8.0	8.0	
Gibson	Fence Spring	12 mi	54,000	6.0	1.2	3
	Development	3	3,000	0.75	0.27	
	Well	1	13,000	0.25	0.08	
	Trough	4	1,100	2.0	2.0	
Gray Wash	Trough	6	$ 1,650	3.0	3.0	1
	Spring Development	4	4,000	1.0	0.35	
	Pipeline	4 mi	34,000	4.0	1.33	
	Fence	8 mi	36,000	4.0	0.8	
	Cattleguard	1	3,150	0.1	0.1	
Greenwood Community	Spring Development	2	2,000	0.5	0.18	3
	Well	1	13,000	0.25	0.08	
	Pipeline	1 mi	8,500	1.0	0.33	
	Fence	9 mi	40,500	4.5	0.9	
	Trough	4	1,100	2.0	2.0	
Greenwood Pk. Community	Trough	10	2,750	5.0	5.0	1
	Catchment	1	20,000	1.5	1.2	
	Spring Development	8	8,000	2.0	0.7	
	Pipeline	2 mi	17,000	2.0	0.67	
	Fence	14 mi	63,000	7.0	1.4	
	Cattleguard	3	9,450	0.3	0.3	
Groom Peak	Spring Development	1	1,000	0.25	0.09	4
	Well	1	13,000	0.25	0.08	
	Pipeline	1 mi	8,500	1.0	0.33	
	Fence	5 mi	22,500	2.5	0.5	
	Trough	3	825	1.5	1.5	
Happy Jack Wash	Trough	3	825	1.5	1.5	4
	Catchment	1	20,000	1.5	1.2	
	Well	1	13,000	0.25	0.08	
	Pipeline	1 mi	8,500	1.0	0.33	
	Fence	5 mi	22,500	2.5	0.5	
	Cattleguard	2	6,300	0.2	0.2	
Hot Springs	--	--	--	--	--	--
Hualapai Peak	Spring Development	3	$ 3,000	0.75	0.26	1
	Pipeline	2 mi	17,000	2.0	0.4	
	Fence	5 mi	22,500	2.5	0.5	
	Cattleguard	1	3,150	0.1	0.1	
	Trough	4	1,100	2.0	2.0	
JJJ	--	--	--	--	--	--
Kayser Wash	--	--	--	--	--	--
Kellis	--	--	--	--	--	--

APPENDIX 2-5 (Continued)
RANGELAND DEVELOPMENT SUMMARY BY ALLOTMENT

Wildlife Enhancement (Continued)

Allotment		Development Type	Unit	Approximate Cost (1981 Dollars)	Acres Disturbed		Construction Year (After Filing of Final EIS)
					Short Term	Long Term	
Kent's Cane Spring	'A'	Catchment	2	40,000	3.0	2.4	4
		Spring Development	4	4,000	1.0	0.35	
		Fence	16 mi	72,000	8.0	1.6	
		Trough	6	1,650	3.0	3.0	
Kent's Cane Spring	'B'	--	--	--	--	--	--
La Cienega		Reservoir	1	5,500	2.0	1.6	3
		Catchment	2	40,000	3.0	2.4	
		Spring Development	10	10,000	2.5	0.87	
		Well	1	13,000	0.25	0.08	
		Pipeline	8 mi	68,000	8.0	2.64	
		Fence	18 mi	81,000	9.0	1.8	
		Cattleguard	2	6,300	0.2	0.2	
		Trough	18	4,950	9.0	9.0	
Lazy YU	'A'	Spring Development	4	4,000	1.0	0.35	4
		Pipeline	2 mi	17,000	2.0	0.67	
		Fence	7 mi	31,500	3.5	0.7	
		Cattleguard	2	6,300	0.2	0.2	
		Trough	5	1,375	2.5	2.5	
Lazy YU	'B'	--	--	--	--	--	--
Lines		Catchment	2	$ 40,000	3.0	2.4	2
		Spring Development	1	1,000	0.25	0.09	
		Fence	10 mi	45,000	5.0	1.0	
		Cattleguard	3	9,450	0.3	0.3	
		Trough	3	825	1.5	1.5	
Little Cane		Reservoir	1	5,500	2.0	1.6	5
		Trough	1	275	0.5	0.5	
Los Molinos		Catchment	1	20,000	1.5	1.2	4
		Spring Development	3	3,000	0.75	0.26	
		Pipeline	2 mi	17,000	2.0	0.67	
		Trough	5	1,375	2.5	2.5	
McElhaney		Reservoir	1	5,500	2.0	1.6	3
		Catchment	1	20,000	1.5	1.2	
		Fence	6 mi	27,000	3.0	0.6	
		Trough	2	550	1.0	1.0	
Round Valley		--	--	--	--	--	--
Sandy	'A'	--	--	--	--	--	--
Sandy	'B'	--	--	--	--	--	
Sweetmilk		--	--	--	--	--	--
Trout Creek		--	--	--	--	--	--
Walnut Creek		Spring Development	6	6,000	1.5	0.53	1
		Pipeline	15 mi	127,500	15.0	5.0	
		Fence	20 mi	90,000	10.0	2.0	
		Cattleguard	4	12,600	0.4	0.4	
		Trough	13	3,575	6.5	6.5	
White Spring		--	--	--	--	--	--
Wikieup		Spring Development	1	$ 1,000	0.25	0.09	4
		Well	1	13,000	0.25	0.08	
		Pipeline	2 mi	17,000	2.0	0.67	
		Trough	3	825	1.5	1.5	
Yellow Pine	'A'	Spring Development	5	5,000	1.25	0.44	1
		Fence	5 mi	22,500	2.5	0.5	
		Trough	5	1,375	2.5	2.5	
Yellow Pine	'B'	--	--	--	--	--	--

APPENDIX 2-6
ESTIMATES OF BIG-GAME NUMBERS*

Allotment Number	Allotment Name	Big-Game Species	Present Numbers**	Reasonable Numbers**[1]
0001	Alamo Crossing	Mule Deer	22 (17)	30 (23)
0002	Arrastra Mountain	Mule Deer	73 (69)	92 (87)
0003	Artillery Range	Mule Deer	73 (58)	89 (71)
		Javelina	5 (4)	32 (26)
		Bighorn	4 (4)	6 (6)
0005	Bagdad	Mule Deer	78 (42)	101 (54)
		Javelina	45 (36)	210 (142)
0006	Bateman Spring	Mule Deer	14 (9)	43 (28)
		Bighorn	16 (15)	26 (24)
0008	Big Sandy	Mule Deer	399 (268)	498 (334)
		Javelina	14 (11)	81 (64)
0009	Black Mesa	Mule Deer	28 (24)	40 (34)
		Javelina	6 (5)	29 (24)
0011	Borianna	Mule Deer	186 (167)	266 (234)
		Javelina	15 (13)	99 (86)
0012	Bottleneck Wash	Mule Deer	35 (35)	39 (39)
0013	Burro Creek	Mule Deer	10 (9)	15 (14)
		Javelina	15 (12)	67 (54)
0014	Burro Creek Ranch	Mule Deer	122 (113)	130 (120)
		Javelina	5 (5)	19 (19)
0116	Byner	Mule Deer	16 (16)	22 (22)
0016	Cane Springs Wash	Mule Deer	16 (8)	20 (10)
		Javelina	10 (5)	30 (15)
0021	Chicken Springs	Mule Deer	290 (171)	358 (211)
		Javelina	3 (2)	22 (15)
0022	Chino Springs	Mule Deer	25 (21)	35 (30)
		Javelina	11 (9)	48 (39)
0028	Diamond Joe	Mule Deer	204 (122)	283 (169)
		Javelina	18 (13)	112 (81)
0031	DDR Ranch	Mule Deer	4 (2)	4 (2)
0033	Fancher Mountain	Mule Deer	13 (13)	13 (13)
0035	Francis Creek	Antelope	80 (66)	95 (76)
		Mule Deer	307 (161)	330 (173)
		Javelina	48 (21)	229 (100)
0103	Gibson	Mule Deer	44 (20)	63 (28)
0038	Gray Wash	Mule Deer	16 (8)	30 (15)
		Javelina	12 (5)	57 (24)
0039	Greenwood Comm.	Mule Deer	29 (21)	42 (30)
		Javelina	0 (0)	5 (4)
0040	Greenwood Pk. Comm.	Mule Deer	65 (50)	85 (65)
		Javelina	13 (9)	94 (65)
0041	Groom Peak	Mule Deer	39 (35)	43 (39)
		Javelina	6 (4)	33 (22)
0043	Happy Jack Wash	Mule Deer	18 (9)	21 (11)
0046	Hot Springs	Mule Deer	2 (1)	2 (1)
		Javelina	2 (2)	10 (10)
0047	Hualapai Peak	Mule Deer	151 (56)	276 (71)
		Elk	16 (5)	27 (8)
2105	JJJ	Mule Deer	7 (7)	7 (7)
0049	Kayser Wash	Mule Deer	14 (14)	14 (14)
0083	Kent's Cane Spring	Mule Deer	259 (128)	325 (148)
		Javelina	20 (7)	132 (46)
0107	Kellis	Mule Deer	24 (24)	24 (24)
0051	La Cienega	Mule Deer	186 (89)	241 (115)
		Javelina	10 (5)	65 (32)
0052	Lazy Yu	Mule Deer	150 (88)	162 (95)
0082	Little Cane	Mule Deer	51 (48)	60 (56)
		Javelina	5 (5)	32 (32)
0110	Lines	Mule Deer	50 (29)	58 (51)
0054	Los Molinos	Mule Deer	84 (75)	164 (146)
		Javelina	20 (18)	66 (59)
0111	McElhaney	Antelope	8 (8)	12 (12)
		Mule Deer	30 (30)	60 (60)
		Javelina	16 (16)	76 (76)
0063	Round Valley	Mule Deer	52 (4)	52 (4)
0064	Sandy	Mule Deer	3 (3)	4 (4)
		Javelina	0 (0)	31 (31)
0115	Sweet Milk	Antelope	7 (7)	7 (7)
		Mule Deer	10 (10)	14 (14)
		Javelina	10 (10)	48 (48)
0069	Trout Creek	Mule Deer	11 (11)	11 (11)
0073	Walnut Creek	Mule Deer	459 (402)	538 (471)
0075	White Spring	Mule Deer	13 (13)	16 (16)
		Javelina	19 (19)	33 (33)
0076	Wickieup	Mule Deer	30 (25)	35 (29)
		Javelina	4 (3)	21 (16)
0078	Yellow Pine	Mule Deer	281 (162)	350 (191)
		Elk	14 (11)	23 (18)

* Allotments listed are those addressed in the Hualapai-Aquarius EIS. For nonintensive allotments numbers are given for public land only. Numbers are not given for ephemeral allotments near Alamo Lake, which are administered by the Lower Gila Resource Area and will be covered in a later EIS.

** Numbers in parentheses indicate estimates for public land only.

[1] See glossary for definition of reasonable numbers.

APPENDIX 2-7
DETERMINING BIG-GAME NUMBERS ON GRAZING ALLOTMENTS

In allocating forage to big game (mule deer, bighorn sheep, pronghorn antelope, javelina, and elk), BLM wildlife biologists used the following procedure to determine big-game numbers in each grazing allotment. The description of procedures uses deer as an example.

1. Obtain estimates of deer numbers from the Arizona Game and Fish Department (AG&FD) for each AG&FD wildlife management unit (WMU). From WMU data applicable to BLM planning units, estimate deer numbers for the planning unit.

2. Map habitat types or standard habitat sites (SHSs) for the planning unit.

3. Sample each habitat type for deer use by pellet group transects, which show deer feces accumulations in a standard unit area. Since deer use is yearlong, pellet group transects show relative deer density in each habitat type.

4. Calculate the acres of each habitat type in the planning unit and multiply the acreage for each type by relative deer densities to determine the total number of deer in each habitat type. The sum of deer numbers in all habitat types should equal the AG&FD total estimate. If it does not, then adjust deer density estimates so that deer densities remain in the same ratio between habitat types as they were originally. The relative use between habitat types should remain the same, but density will change.

5. Overlay an allotment map on the habitat type map and calculate acres of each habitat type within an allotment. Then multiply the acres of each habitat type by the corresponding density values to obtain the total number of deer for an allotment.

6. Consult with AG&FD game specialists and wildlife managers on the estimated deer numbers per allotment. AG&FD censuses, harvest data, and professional judgment may suggest that estimates of numbers in some allotments are wrong due to habitat condition or other problems. Adjust numbers on these allotments so that the total equals the AG&FD esitmate for the planning unit.

APPENDIX 2-8

PROGRAMMATIC MEMORANDUM OF AGREEMENT
BETWEEN THE
DEPARTMENT OF THE INTERIOR, BUREAU OF LAND MANAGEMENT,
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION,
AND THE
NATIONAL CONFERENCE OF STATE HISTORIC PRESERVATION OFFICERS
REGARDING THE
LIVESTOCK GRAZING AND RANGE IMPROVEMENT PROGRAM

WHEREAS, the Department of the Interior, Bureau of Land Management, administers public lands, principally in the 11 Western States and Alaska, under concepts of multiple-use and sustained yield, and, among other responsibilities, the Bureau of Land Management is charged with management of rangeland and forage products under the Taylor Grazing Act of 1934 (43 U.S.C. 315) and the Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701), which also charges the Bureau of Land Management with the management and protection of cultural resources; and

WHEREAS, Section 106 of the National Historic Preservation Act (16 U.S.C. 470f, as amended, 90 Stat. 1320 requires that the head of any Federal agency having direct or indirect jurisdiction over a proposed Federal, federally assisted, or federally licensed undertaking affecting properties in or eligible for the National Register of Historic Places shall afford the Advisory Council on Historic Preservation (hereafter Council) a reasonable opportunity for comment; and

WHEREAS, livestock grazing and range improvement activities undertaken by the Bureau of Land Management may have an effect upon properties in or eligible for the National Register of Historic Places and will require compliance with Section 106 of the National Historic Preservation Act, Section 2 of Executive Order 11593, May 13, 1971, "Protection and Enhancement of the Cultural Environment," and the Council's regulations, "Protection of Historic and Cultural Properties" (36 CFR Part 800); and

WHEREAS, the Bureau of Land Management is currently engaged in an ongoing program of rangeland management which involves the preparation, by 1988, of approximately 145 environmental statements on specific areas where grazing is permitted on approximately 174 million acres of public lands in the Western States and has requested Council review of the rangeland management program; and

WHEREAS, the Council and the Bureau of Land Management have met and reviewed the livestock grazing and range improvement program of the Bureau of Land Management and its relation to compliance with Section 106 of the National Historic Preservation Act of 1966 and Executive Order 11593, as implemented by the Council's regulations (36 CFR Part 800) and the responsibilities for historic and cultural resources under the National Environmental Policy Act of 1969 (42 U.S.C. 4321) as implemented by the Council on Environmental Quality in the "National Environmental Policy Act Regulations" (40 CFR Parts 1500-1508).

NOW, THEREFORE, it is mutually agreed that the Bureau of Land Management will ensure, through the stipulations outlined in this Programmatic Memorandum of Agreement, that historic and cultural properties will be given adequate consideration in grazing management program decisions and implementation which includes, but is not limited to, the preparation of grazing environmental statements, thereby meeting its responsibilities under Section 106 of the National Historic Preservation Act.

STIPULATIONS

1. The Bureau of Land Management will conduct Class I (existing data inventory) and Class II (sampling field inventory) inventories of historic and cultural properties, as specified in BLM Manual Section 8111, to be completed at the appropriate planning stage and prior to the preparation of the draft environmental statement. Inventory results will be evaluated, in consultation with the appropriate State Historic Preservation Officer, to identify properties included in or eligible for inclusion in the National Register of Historic Places.

   a. The inventory requirement may be modified on a case by case basis for interim grazing environmental statements (i.e., those prepared during fiscal years 1979 through 1981) if an alternative is acceptable to the appropriate State Historic Preservation Officer.

   b. If an acceptable alternative cannot be negotiated with the appropriate State Historic Preservation Officer, then the Bureau of Land Management will proceed with the preparation of the environmental statement and request the comments of the Council in accordance with 36 CFR 800. The Council's comments will be included in the final environmental statement.

2. This Programmatic Memorandum of Agreement and the inventory reports identifying historic and cultural properties will be referenced in each environmental statement.

3. Prior to commencement of any range improvement activities which involve land disturbance, the Bureau of Land Management will conduct a Class III inventory, as specified in the BLM Manual Section 8111.14, supplementing previous surveys to locate, identify, and evaluate properties in the impact area that may be eligible for inclusion in the National Register of Historic Places. Range improvement activities which involve land disturbance include, but are not limited to, such activities as construction of fencing and corrals, water development, chaining, and controlled burning. If properties that may be eligible for the National Register are found, the Bureau of Land Management will consult with the appropriate State Historic Preservaiton Officer and forward the documentation to the Keeper of the National Register to obtain a determination of eligibility in accordance with 36 CFR Part 1204.

4. The Bureau of Land Management will provide the appropriate State Historic Preservation Officer with copies of the reports of the Class I, II, and III inventories in accordance with Sections 102(a)(2) and 202(c)(9) of the Federal Land Policy and Management Act of 1976 for inclusion as part of the State inventory conducted pursuant to 36 CFR Part 61.

5. The Bureau of Land Management will design the livestock grazing and range improvement program to avoid adverse effects on properties included in or eligible for inclusion in the National Register of Historic Places, unless this is not prudent or feasible.

6. Where it is not prudent or feasible to avoid adverse effects on properties included in or eligible for inclusion in the National Register of Historic Places as part of a livestock grazing and range improvement program authorization and the property is not a National Historic Landmark or National Historic Site, the Bureau of Land Management will consult with the appropriate State Historic Preservation Officer and will:
   a. Develop mutually acceptable measures to mitigate the impact of the proposed action; and

   b. Notify the Council in writing of agreements reached with the State Historic Preservation Officer under the provisions of 6(a) above. The Council need not be afforded further opportunity for review and comment.

7. The provisions of this Programmatic Memorandum of Agreement shall apply to the States of Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

8. If it is determined that the affected property is a National Historic Landmark or National Historic Site, or agreement cannot be reached between the Bureau of Land Management and the appropriate State Historic Preservation Officer on satisfactory mitigation measures, the Bureau of Land Management will request the comments of the Council in accordance with 36 CFR Part 800.

9. At the request of the President or a Member of Congress, the Council may advise the Bureau of Land Management, that a particular action, authorized by a grazing permit or lease, will require individual review and comment pursuant to 36 CFR Part 800. In that event, the Bureau of Land Management will compiy with the provisions of the Council's regulations.

10. The Council and the Bureau of Land Management will review the provisions of this Agreement on an annual basis to determine whether modification or termination is appropriate. Should the current livestock grazing program of the Bureau of Land Management be revised, the ratifying parties will mutually determine whether the provisions of the Agreement will continue to apply.

Robert Utley 8/20/79
Deputy Executive Director, Advisory Council on Historic Preservation

Ed Hastey 12/21/79
Associate Director, Bureau of Land Management

Larry E. Tise 8/26/79
President, National Conference of State Historic Preservation Officers

Richard H. Jenrette 1/14/80
Chairman, Advisory Council on Historic Preservation

APPENDIX 2-9
RANGELAND MANAGEMENT GUIDELINES FOR LANDS UNDER WILDERNESS REVIEW [1]

1. General

In some respects, rangeland management activities are less restricted by the Interim Management Policy than other activities. This is partly because livestock grazing, at appropriate stocking levels, in itself, is compatible with maintaining wilderness suitability; it is partly because most grazing operations on the public lands qualify as grandfathered uses; and it is partly because some range improvements enhance wilderness values by better protecting the rangeland in a natural condition.

Some of the rangeland management activities involve a distinction between grazing uses that are "grandfathered" by section 603(c) of FLPMA and those that are not. The criteria for these two categories follow:

a. Grandfathered grazing use is that grazing authorized and used during the 1976 grazing fee year, including areas that were in the "rest" cycle of a grazing system.

b. Non-grandfathered grazing use is any grazing that was not authorized and used during the 1976 grazing fee year.

2. Grazing

a. Changes in Grazing. In both grandfathered and non-grandfathered grazing, changes in number and kind of livestock or period of use may be permitted, so long as (1) the changes do not cause declining condition or trend of the vegetation or soil, and (2) the changes do not cause unnecessary or undue degradation of the lands.

b. Prevention of Unnecessary or Undue Degradation. The grandfather clause does not freeze grandfathered grazing uses at the same level as existed on October 21, 1976. The mandate, in section 603(c), to prevent unnecessary or undue degradation of the lands explicitly applies to grandfathered uses. Thus, the grandfather provision will not prevent implementation of reductions in authorized use adopted in allotment management plans.

c. Grazing Systems. Grazing systems in operation during the 1976 grazing fee year may continue to be used and maintained; any new range improvements must satisfy the guidelines for range improvements in section 3, below. New grazing systems may be established as long as the new range improvements needed to implement the system are permissible under the guidelines in section 3.

d. Motor Vehicles. Motorized access on existing access routes may be permitted. Cross-country motorized access may be authorized along routes specified by the BLM if it satisfies the nonimpairment criteria, including reclamation requirements; no grading or blading will be permitted. Temporary roads may be built if the BLM has determined that they satisfy the nonimpairment criteria.

3. Range Improvements

This section sets forth the general criteria that will govern the use, maintenance, and installation of range improvements. The following section 4 shows how these criteria will affect certain specific types of improvements.

a. Pre-FLPMA Range Improvements. Range improvements existing or under construction on October 21, 1976, may continue to be used and maintained.

b. New, Grandfathered Range Improvements. In a grandfathered grazing operation, if a permit between the BLM and the grazing operator, issued before October 21, 1976, provided for installation by the operator of a series or system of improvements and part of that series or system had been installed before that date, the remaining improvements of the same kind may be installed.

c. New, Temporary Range Improvements. Temporary range improvements may be installed if they satisfy the nonimpairment criteria.

d. New, Permanent Range Improvements. New, permanent range improvements not permissible under (b) above may be approved for the purpose of enhancing wilderness values by better protecting the rangeland in a natural condition. In such cases they must meet all of the following criteria:

--they would not require motorized access if the area were designated as wilderness;

--the improvements are substantially unnoticeable in the wilderness study area (or inventory unit) as a whole;

--after any needed reclamation is complete, the area's wilderness values must not have been degraded so far, compared with the area's values for other purposes, as to significantly constrain the Secretary's recommendation with respect to the area's suitability or nonsuitability for preservation as wilderness.

For construction of approved range improvements, cross-country use of motor vehicles or construction of temporary access routes may be approved if BLM has determined that they satisfy the nonimpairment criteria.

4. Specific Guidelines for Range Improvements

a. Salting. In both grandfathered and non-grandfathered grazing operations, salting practices may be continued. New salting locations may be established to improve the distribution of grazing use so long as motorized access is on existing ways and trails or is cross-country access determined by the BLM to satisfy the nonimpairment criteria.

b. Supplemental Feeding. Supplemental feeding may be continued in grandfathered grazing operations if it was part of the operation in the 1976 grazing fee year. Otherwise, in both grandfathered and non-grandfathered grazing, supplemental feeding may be done in cases where BLM has determined that it satisfies the nonimpairment criteria and under emergency conditions, such as unexpected heavy snowfall.

c. Fences. In both grandfathered and non-grandfathered grazing, new, permanent fences may be built and maintained if the BLM determines that they are needed to better protect the rangeland in a natural condition. Barbed wire and wood or steel fence posts may be used; the fence will be designed to blend with the landscape and topography, and must meet the criteria in section 3 (d) above.

d. Water Developments. In both grandfathered and non-grandfathered grazing, new, permanent water developments will be limited as follows, and must meet the criteria in section 3 (d) above:

--Springs may be developed so long as the water trough blends into the surrounding landscape, and the pipeline area is put back to original contour, and plant cover restored as specified in the nonimpairment criteria.

--Reservoirs, pits, and charcos may be developed if they are designed and constructed to blend into the surrounding landscape. They should be no larger than necessary, and not to exceed 10 acre feet in storage capacity. Borrow areas for fills will be from the impoundment area or within the high-water area.

e. Vegetative Manipulation. This includes chemical, mechanical, and biological methods. In grandfathered grazing operations, if vegetative manipulation had been done on the allotment before October 21, 1976, and its impacts were noticeable to the average visitor on that date, the improvement may be maintained by applying the same treatment again on the land previously treated. Otherwise, vegetative manipulation may be used only for control of small areas of poisonous plants or in emergencies for control of insects and disease when there is no effective alternative. Limited exceptions are specified as follows:

--Prescribed burning may also be used where necessary to maintain fire-dependent natural ecosystems.

--Reseeding may also be done by hand or aerial methods to restore natural vegetation. (There is also a provision for reseeding in emergency rehabilitation projects, described in section G of this chapter.)

5. Wild Horse and Burro Management

Temporary facilities for management of wild horses and burros may be installed if they satisfy the nonimpairment criteria. The above guidelines for grazing practices and range improvements will also apply to wild horse and burro management, where appropriate.

[1] Source: BLM, 1979b, p. 22-24.

APPENDIX 2-10
NONIMPAIRMENT CRITERIA FOR LANDS UNDER WILDERNESS REVIEW[1]

Activities will be considered nonimpairing if the BLM determines that they meet each of the following criteria:

(a) Activities are temporary. This means that the use or activity may continue until the time when it must be terminated in order to meet the reclamation requirement of paragraphs (b) and (c) below. A temporary use that creates no new surface disturbance may continue unless Congress designates the area as wilderness, so long as it can easily and immediately be terminated at that time, if necessary to management of the area as wilderness.

(b) Any temporary impacts caused by the activity must, at a minimum, be capable of being reclaimed to a condition of being substantially unnoticeable in the wilderness study area (or inventory unit) as a whole by the time the Secretary of the Interior is scheduled to send his recommendations on that area to the President, and the operator will be required to reclaim the impacts to that standard by that date. If the wilderness study is postponed, the reclamation deadline will be extended accordingly. If the wilderness study is accelerated, the reclamation deadline will not be changed. A full schedule of wilderness studies will be developed by the Department upon completion of the intensive wilderness inventory. In the meantime, in areas not yet scheduled for wilderness study, the reclamation will be scheduled for completion within 4 years after approval of the activity. (Obviously, if and when the Interim Management Policy ceases to apply to an inventory unit dropped from wilderness review following a final wilderness inventory decision of the BLM State Director, the reclamation deadline previously specified will cease to apply.) The Secretary's schedule for transmitting his recommendations to the President will not be changed as a result of any unexpected inability to complete the reclamation by the specified date, and such inability will not constrain the Secretary's recommendation with respect to the area's suitability or nonsuitability for preservation as wilderness.

The reclamation will, to the extent practicable, be done while the activity is in progress. Reclamation will include the complete recontouring of all cuts and fills to blend with the natural topography, the replacement of topsoil, and the restoration of plant cover at least to the point where natural succession is occurring. Plant cover will be restored by means of reseeding or replanting, using species previously occurring in the area. If necessary, irrigation will be required. The reclamation will be complete, and the impacts will be substantially unnoticeable in the area as a whole, by the time the Secretary is scheduled to send his recommendations to the President.

(c) When the activity is terminated, and after any needed reclamation is complete, the area's wilderness values must not have been degraded so far, compared with the area's values for other purposes, as to significantly constrain the Secretary's recommendation with respect to the area's suitability or nonsuitability for preservation as wilderness. The wilderness values to be considered are those mentioned in section 2(c) of the Wilderness Act, including naturalness, outstanding opportunities for solitude or for primitive and unconfined recreation, and ecological, geological or other features of scientific, educational, scenic, or historical value.

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[1] Source: BLM, 1979b, p.18.

APPENDIX 3-1
CURRENT RANGELAND CONDITION AND APPARENT TREND BY ALLOTMENT [1]
(On Public Land)

Allotment	Poor	Fair	Good	Excellent	Total	Trend		
						Up	Static	Down
Alamo Crossing	0	9,411	11,499	0	20,910	0	13,257	7,653
Arrastra Mountain	1,162	16,312	7,293	0	24,767	5,399	18,390	978
Artillery Range	6,734	37,244	27,875	0	71,853	550	58,951	12,352
Bagdad	488	10,599	11,170	3,039	25,296	7,411	17,632	353
Bateman Spring	1,011	14,783	1,992	0	17,786	1,191	12,851	3,744
Big Sandy	2,604	38,544	15,495	0	56,643	0	56,643	0
Black Mesa	0	3,067	3,901	0	6,968	0	6,829	139
Boriana	861	19,419	18,425	0	38,705	9,555	23,805	5,345
Bottleneck Wash	53	81	0	0	134	0	100	34
Burro Creek	21	2,984	1,814	0	4,819	0	2,509	2,310
Burro Creek Ranch	2,166	24,624	7,798	0	34,588	1,804	28,216	4,568
Byner	270	1,383	2,074	0	3,727	0	1,634	2,093
Cane Springs Wash	152	1,368	0	0	1,520	654	0	866
Chicken Springs	0	64,855	19,579	0	84,434	27,278	46,820	10,336
Chino Springs	2,360	14,341	2,445	0	19,146	0	11,961	7,185
Diamond Joe	3,938	6,084	6,227	0	16,249	3,553	10,756	1,940
DOR	327	751	0	0	1,078	0	142	935
Fancher Mountain	342	1,023	1,785	0	3,150	2,016	792	342
Francis Creek	0	8,987	34,177	7,793	50,957	14,409	36,548	0
Gibson	3,400	12,230	1,935	0	17,565	0	5,168	12,397
Gray Wash	266	5,533	2,756	0	8,555	710	6,662	1,183
Greenwood Community	2,704	11,638	2,130	0	16,472	0	11,049	5,423
Greenwood Pk. Community	1,813	30,397	734	0	32,944	1,334	25,910	5,700
Groom Peak	248	4,955	73	0	5,276	73	4,720	483
Happy Jack Wash	242	10,009	6,615	8,668	25,534	5,056	18,722	1,756
Hot Springs	0	924	122	16	1,062	0	1,062	0
Hualapai Peak	0	5,302	0	0	5,302	1,515	3,630	157
JJJ	0	0	303	0	303	0	303	0
Kayser Wash	0	32	608	0	640	0	0	640
Kellis	0	593	874	0	1,467	0	874	593
Kent's Cane Springs	0	10,240	5,238	0	15,478	963	12,267	2,248
La Cienega	17,071	35,260	18,972	0	71,303	0	71,303	0
Lazy Yu	113	8,079	6,118	0	14,310	2,038	9,721	2,551
Lines	895	11,725	1,540	62	14,222	367	12,939	916
Little Cane	3,129	2,589	0	0	5,718	0	3,467	2,251
Los Molinos	257	1,706	14,442	1,146	17,551	1,146	11,392	5,013
McElhaney	0	0	9,180	0	9,180	0	9.180	0
Round Valley	32	608	0	0	640	0	608	32
Sandy	382	759	0	0	1,141	152	989	0
Sweetmilk	0	2,500	1,150	0	3,650	0	2,803	847
Trout Creek	0	640	0	0	640	0	0	640
Walnut Creek	26,397	17,223	29,786	0	73,406	0	73,341	65
White Spring	283	1,102	0	0	1,385	176	1,209	0
Wikieup	853	2,844	4,666	0	8,363	4,474	1,566	2,323
Yellow Pine	8,429	13,483	0	0	21,912	28	20,723	1,161
TOTALS	89,003	466,231	280,791	20,724	856,749	91,852	657,444	107,453

[1] Units are in acres.

APPENDIX 3-2
SOIL SERIES CLASSIFIED ACCORDING TO CURRENT SYSTEM OF CLASSIFICATION

Series	Family	Subgroup	Order
Abra	Fine-loamy, mixed, mesic	Ustollic Calciorthids	Aridisols
Aco	Coarse-loamy, mixed (calcareous) mixed, hyperthermic	Typic Torriorthents	Entisols
Anthony	Coarse-loamy, mixed (calcareous) thermic	Typic Torriflurents	Entisols
Arizo	Sandy-skeletal, mixed, thermic	Typic Torriorthents	Entisols
Barkerville	Sandy-skeletal, mixed, mesic	Typic Ustorents	Entisols
Cabezon	Clayey, montmorillonitic, mesic	Lithic Argiustolls	Mollisols
Cave	Loamy, mixed, thermic, shallow	Typic Paleorthids	Aridisols
Cavelt	Loamy, mixed, hyper-thermic, shallow	Typic Paleorthids	Aridisols
Cellar	Loamy-skeletal, mixed, nonacid, thermic	Lithic Torriorthents	Entisols
Continental	Fine, mixed, thermic	Typic Haplargids	Aridisols
Eba	Clayey-skeletal, mixed thermic	Typic Haplargids	Aridisols
Faraway	Loamy-skeletal, mixed, mesic	Lithic Haplustolls	Mollisols
Frees	Coarse-loamy, mixed, frigid	Lithic Haploborolls	Mollisols
Gaddes	Fine-loamy, mixed, mesic	Ustollic Haplargids	Aridisols
Hayhook	Coarse loamy, nonacid, thermic	Typic Torriorthents	Entisols
House Mountain	Loamy, mixed, nonacid, thermic	Lithic Torriorthents	Entisols
Latene	Coarse-loamy, mixed, thermic	Typic Calciorthids	Aridisols
Lonti	Fine, mixed, mesic	Ustolic Haplargids	Aridisols
Luzena	Clayey, montmorillonitic, mesic	Lithic Argiustolls	Mollisols
Pastura	Loamy, mixed, mesic, shallow	Ustollic Paleorthids	Aridisols
Rillino	Coarse-loamy, mixed, thermic	Typic Calciorthids	Aridisols
Rillito	Coarse-loamy, mixed, hyperthermic	Typic Calciorthids	Aridisols
Schenco	Loamy-skeletal, mixed, shallow	Typic Camborthids	Aridisols
Springerville	Fine, montmorillonitic, mesic	Typic Chromusterts	Veritsols
Thunderbird	Fine, montmorillonitic, mesic	Aridic Argiustolls	Mollisols

APPENDIX 3-3
METHODOLOGY FOR ESTIMATING SEDIMENT YIELD

Summary

Sediment yield was estimated using a method developed by the Pacific Southwest Interagency Committee (PSIAC) (1968). This method was modified (Clark, 1978; Johnson and Gebhardt, 1979) to allow the use of existing watershed (BLM, 1974-1975) and soils (SCS, 1976b; BLM, 1979a;b) inventory data. Nine factors including physical, climatological, and land use parameters are rated, summed, and coverted to sediment yield (acre-feet/square mile/year). Steps in estimating sediment yield are (1) assembling data elements for each of the nine factors, (2) converting these data elements to PSIAC rating points for each factor, (3) summing all the rating points, and (4) converting the total rating to average annual sediment yield. In this analysis, estimates were made for soil associations. Sediment yield estimates for the entire EIS area were made using area weighted average soil association estimates.

Description of Rating Factors

The following table lists the nine factors evaluated, the data element collected, the source of the data, the source of the rating conversion and whether or not the factor would change under the proposed action or alternatives. Except for runoff and land use factors, published nomographs were used to convert the data elements into rating points.

PSIAC Factor	Data Input	Data Source	Conversion to PSIAC	Modified by Grazing Alternatives
Surface Geology				
Soils	'K' Factor	SCS, 1976b	Johnson & Gebhardt, 1979	No
Climate	2 year, 6-hour rainfall	U.S. Dept. Commerce, 1967	Clark, 1978	No
Runoff	Cover; Soils	BLM, 1974-75 URA	Curve Number/10	No
Topography	Slope	BLM, 1974-75	Clark, 1978	No
Ground Cover	Bare Ground	BLM, 1974-75	Clark, 1978	Yes
Land Use	Grazing Intensity	Estimated	Estimated	Yes
Upland Erosion	Present SSF	BLM, 1974-75	Clark, 1978	Yes
Channel Erosion and Sediment Transport	Gully Factor	BLM, 1974-75	Clark, 1978	No

A brief summary of evaluation and conversion of each factor is given below.

1. Surface Geology - assumed to be the same as the soils factor.
2. Soils - calculated from an erosion susceptibility indicator called a 'K' factor.
3. Climate - use of a rainfall intensity map and published nomograph.
4. Runoff - use of cover and soils data to develop a curve number (CN) or runoff indicator, which was divided by 10.
5. Topography - use of weighted percent slope and nomograph.
6. Ground Cover - use of bare ground area and nomograph.
7. Land Use - estimated based on grazing intensity and rating criteria.
8. Upland Erosion - use of an erosion condition estimator (SSF) and nomograph.
9. Channel Erosion/Transport - use of a "gully factor" used in erosion condition estimates and a nomograph.

Analysis of the change was limited to ground cover, land use, and upland erosion. Expected changes in cover, reduced or increased grazing intensity, and erosion condition were quantified, converted to PSIAC rating points and totaled to estimate sediment yield under the proposed action and alternatives.

APPENDIX 3-4
CULTURAL RESOURCE SENSITIVITY BY ALLOTMENT

Allotment		Total Acres	Acres Sensitive Area	Index of Sensitivity*	Sensitivity Adjusted Rank	Sensitivity Raw Rank
Alamo Crossing		23,340	11,520	49.4	10	12
Arrastra Mountain		25,745	6,560	25.5	19	17
Artillery Range		88,481	7,200	8.1	34	16
Bagdad		39,750	12,160	30.6	15	11
Bateman Springs		26,604	0	0.0	--	--
Big Sandy		88,406	4,160	4.7	37	22
Black Mesa		7,654	1,600	20.9	22	28
Boriana	'A'	39,425	15,040	38.1	14	8
	'B'	12,690	0	0.0	--	--
Bottleneck Wash		9,280	640	6.9	35	32
Burro Creek		6,061	6,061	100.0	1	19
Burro Creek Ranch		38,663	10,560	27.3	18	13
Byner		26,880	18,560	69.0	5	6
Cane Springs Wash	'A'	1,920	480	25.0	20	33
	'B'	1,440	1,120	77.8	3	30
Chicken Springs		137,186	800	0.6	42	31
Chino Springs		19,146	3,840	20.0	24	23
Diamond Joe		22,933	1,920	8.4	33	27
DOR		2,540	1,120	44.1	13	30
Fancher Mountain		23,040	4,480	19.4	26	20
Francis Creek		110,441	52,160	2.1	40	1
Gibson		33,430	17,920	53.6	6	7
Gray Wash		16,976	3,360	19.8	25	24
Greenwood Community		23,181	4,320	18.6	28	21
Greenwood Pk. Community		48,265	23,360	48.4	11	4
Groom Peak		7,071	1,120	15.8	31	30
Happy Jack Wash		41,483	320	0.8	41	34
Hot Springs		1,258	640	50.9	8	32
Hualapai Peak		13,010	2,240	17.2	29	26
JJJ		303	303	100.0	1	35
Kayser Wash		3,520	1,600	2.2	40	28
Kellis		16,960	3,200	18.9	27	25
Kent's Cane Spring	'A'	30,882	14,080	45.6	12	9
	'B'	41,600	31,360	75.4	4	2
La Cienega		167,576	8,960	5.3	36	15
Lazy Yu	'A'	21,543	6,400	29.7	16	18
	'B'	1,940	0	0.0	--	--
Lines		23,063	640	2.8	38	32
Little Cane		6,038	160	2.6	39	36
Los Molinos		19,636	0	0.0	--	--
McElhaney		32,160	9,280	28.9	17	14
Round Valley		7,360	0	0.0	--	--
Sandy	'A'	960	160	16.7	30	36
	'B'	2,240	1,920	85.7	2	27
Sweetmilk		57,760	13,280	23.0	21	10
Trout Creek		2,560	1,280	50.0	9	29
Walnut Creek		84,591	23,680	28.0	18	3
White Spring		2,560	1,280	50.0	9	29
Wikieup		10,970	2,240	20.4	23	26
Yellow Pine	'A'	39,114	20,480	52.4	7	5
	'B'	21,440	1,920	9.0	32	27

*Index of Sensitivity = $\frac{\text{Sensitive Area}}{\text{Total Area}} \times 100$

APPENDIX 3-5
MARKET RESEARCH DATA SUMMARY: MOHAVE COUNTY

This appendix summarizes a part of the data from a survey conducted in Mohave and Yavapai Counties in September 1980. RGL Enterprises, a private market research firm in Phoenix, Arizona, developed and administered the copyrighted survey form. The data summarized in this appendix are available in the BLM Arizona State Office.

Survey forms were mailed to 525 persons listed in applicable 1980 telephone books. The sampling frame consisted of approximately 12,000 listings. Contacts were selected on the basis of the frequency in which the fifth digit of a telephone number appeared in the telephone book. A table of random numbers determined this frequency.

There was a 39.8 percent response rate, resulting in a return of 203 completed questionnaires. The sampling error for the survey was about 5 percent. Generally, the survey results are accurate within a 10 percent variation.

		Percent	
		Rural	Urban
1.	Place of residence	42.0	58.0
2.	Sex: Male	46.1	53.9
	Female	36.9	63.1
3.	Income: Under $10,000	21.5	33.0
	$10,000-$25,000	47.6	36.7
	Over $25,000	30.8	30.7
4.	Type of Business/Employment:		
	Agriculture	23.1	0.0
	Mining	13.8	2.3
	Construction	6.2	9.1
	Manufacture	6.2	14.8
	Transportation, Cummunication, Public Utility	3.1	1.1
	Finance, Insurance, Real Estate	1.5	3.4
	Services	15.4	11.4
	Federal Government	4.6	5.7
	State and Local Government	4.6	13.6
	Other (Retired or None)	13.8	28.4
5.	"How much do you feel you know about BLM?"		
	"... A lot"	21.5	5.6
	"... Pretty much"	32.3	59.5
	"... Some"	38.5	22.5
	"... Not much"	4.6	6.7
	"... Little"	3.1	5.6
6.	"What kind of job has BLM done in the past year?"		
	"... Very good"	3.1	1.1
	"... Good"	3.1	20.2
	"... Okay"	20.0	37.1
	"... Not very good"	29.2	18.0
	"... Poor"	40.0	16.9
	"... Don't Know/No opinion"	4.6	6.7
7.	"How do you feel about outdoor recreation?"		
	"... Very important"	25.8	44.0
	"... Important"	48.5	42.9
	"... Not important"	25.8	13.2
8.	"How do you feel about ranching?"		
	"... Very important"	47.0	41.8
	"... Important"	37.9	44.0
	"... Not important"	15.2	14.3
9.	"How do you feel about wildlife?"		
	"... Very Important"	22.7	14.4
	"... Important"	28.8	40.0
	"... Not important"	48.5	45.5
10.	"How do you feel about wilderness areas?"		
	"... Very Important"	3.1	5.6
	"... Important"	15.4	22.5
	"... Not important"	81.5	71.9
11.	"How do you feel about mining?"		
	"... Very Important"	27.3	26.7
	"... Important"	43.9	51.1
	"... Not important"	28.8	22.2
12.	"Are you familiar with the 'Sagebrush Rebellion'?"		
	"... Yes"	90.1	95.6
	"... No"	9.9	4.4
13.	"What do you think about the 'Sagebrush Rebellion'?"		
	"... A great idea"	13.6	11.1
	"... A good idea"	54.5	37.8
	"... Not a good idea"	10.6	22.2
	"... Afraid of the idea"	3.0	8.8
	"... Don't know/No opinion"	20.0	20.0
14.	"How much importance do Federal agencies in your County place on public opinion?"		
	"... A lot"	3.1	6.7
	"... Pretty much"	10.6	16.9
	"... Not much"	13.6	28.1
	"... Very little"	68.2	40.4
	"... Don't know/No opinion"	3.1	7.9
15.	"How much importance should Federal agencies in your County place on public opinion?"		
	"... A lot"	6.2	12.5
	"... Pretty much"	44.6	44.3
	"... Not much"	30.8	15.9
	"... Don't know/No opinion"	18.5	27.3
16.	"How do you rate BLM public contact efforts?"		
	"... Very good"	1.5	0.0
	"... Good"	3.1	15.6
	"... Okay"	44.6	42.2
	"... Not very good"	20.0	17.8
	"... Poor"	26.2	11.1
	"... Don't Know/No opinion"	4.6	13.3
17.	"How do you rate BLM public meetings?"		
	"... Very good"	1.5	1.1
	"... Good"	10.8	16.7
	"... Okay"	26.2	38.9
	"... Not very good"	23.1	14.4
	"... Poor"	32.3	17.8
	"... Don't Know/No opinion"	6.2	11.1
18.	"How du you rate BLM public information?"		
	"... Very good"	1.5	0.0
	"... Good"	4.6	16.7
	"... Okay"	26.2	40.0
	"... Not very good"	24.6	24.4
	"... Poor"	32.3	7.8
	"... Don't Know/No opinion"	10.8	11.1
19.	"How much importance does BLM place on public opinion?"		
	"... A lot"	0.0	1.1
	"... Enough"	12.3	16.9
	"... Some"	29.2	32.6
	"... Very little"	36.9	19.1
	"... None"	18.5	14.6
	"... Don't know/No opinion	4.6	15.7
20.	"What kind of response has BLM had to public concerns and issues?"		
	"... Very good"	1.5	1.1
	"... Good"	10.8	9.0
	"... Okay"	21.5	29.2
	"... Not very good"	29.2	25.8
	"... Poor"	35.4	19.1
	"... Don't Know/No opinion"	1.5	15.7

APPENDIX 4-1
PROJECTED RANGELAND CONDITION BY ALLOTMENT
(On Public Land)[1]

PROPOSED ACTION AND WILDLIFE ENHANCEMENT

Allotment	Poor[2]	Fair	Good	Excellent	Total
Alamo Crossing	0	9,411	11,499	0	20,910
Arrastra Mountain	0	2,056	15,418	7,293	24,767
Artillery Range	652	17,117	39,535	14,549	71,853
Bagdad	0	1,321	11,573	12,402	25,296
Bateman Spring	1,011	5,734	9,049	1,992	17,786
Big Sandy	248	2,705	39,821	13,869	56,643
Black Mesa	0	728	2,720	3,520	6,968
Boriana	747	7,539	15,244	15,175	38,705
Bottleneck Wash	54	80	0	0	134
Burro Creek	21	0	2,984	1,814	4,819
Burro Creek Ranch	1,912	1,218	24,429	7,029	34,588
Byner	1,653	956	1,118	0	3,727
Cane Springs Wash	866	0	654	0	1,520
Chicken Springs	0	11,338	58,266	14,830	84,434
Chino Springs	2,360	14,341	2,445	0	19,146
Diamond Joe	19	3,919	6,084	6,227	16,249
DOR	328	750	0	0	1,078
Fancher Mountain	342	1,592	1,216	0	3,150
Francis Creek	0	1,681	9,165	40,111	50,957
Gibson	924	3,341	11,365	1,935	17,565
Gray Wash	266	2,429	3,408	2,452	8,555
Greenwood Community	1,872	4,382	8,088	2,130	16,472
Greenwood Pk. Community	1,813	2,847	27,550	734	32,944
Groom Peak	0	483	4,720	73	5,276
Happy Jack Wash	0	8,931	4,128	12,475	25,534
Hot Springs	0	924	122	16	1,062
Hualapai Peak	0	0	5,302	0	5,302
JJJ	0	0	303	0	303
Kayser Wash	32	608	0	0	640
Kellis	593	0	874	0	1,467
Kent's Cane Springs	0	2,248	7,992	5,238	15,478
La Cienega	9,052	8,011	35,266	18,974	71,303
Lazy Yu	113	1,557	8,920	3,720	14,310
Lines	895	21	11,807	1,499	14,222
Little Cane	3,325	786	1,607	0	5,718
Los Molinos	0	257	1,706	15,588	17,551
McElhaney	0	0	0	9,180	9,180
Round Valley	416	224	0	0	640
Sandy	381	522	238	0	1,141
Sweetmilk	2,047	1,603	0	0	3,650
Trout Creek	640	0	0	0	640
Walnut Creek	17,686	8,838	17,095	29,787	73,406
White Spring	815	570	0	0	1,385
Wikieup	640	1,682	1,374	4,667	8,363
Yellow Pine	0	9,590	12,322	0	21,912
TOTALS	51,723	142,340	415,407	247,279	856,749

MODERATE GRAZING MANAGEMENT

Allotment	Poor[2]	Fair	Good	Excellent	Total
Alamo Crossing	0	9,410	11,500	0	20,910
Arrastra Mountain	1,600	8,016	10,918	4,233	24,767
Artillery Range	16,962	7,224	47,667	0	71,853
Bagdad	841	7,200	5,575	11,680	25,296
Bateman Spring	4,604	10,000	3,182	0	17,786
Big Sandy	2,604	28,688	12,465	12,886	56,643
Black Mesa	139	2,931	2,151	1,747	6,968
Boriana	4,779	8,470	10,753	14,703	38,705
Bottleneck Wash	53	81	0	0	134
Burro Creek	21	475	4,323	0	4,819
Burro Creek Ranch	2,608	14,141	10,810	7,029	34,588
Byner	1,653	956	1,118	0	3,727
Cane Springs Wash	866	0	654	0	1,520
Chicken Springs	2,668	34,658	39,104	8,004	84,434
Chino Springs	2,360	14,341	2,445	0	19,146
Diamond Joe	3,938	1,921	4,161	6,229	16,249
DOR	327	751	0	0	1,078
Fancher Mountain	342	1,592	1,216	0	3,150
Francis Creek	0	3,520	15,831	31,606	50,957
Gibson	3,903	10,490	1,762	1,410	17,565
Gray Wash	334	3,786	2,773	1,662	8,555
Greenwood Community	6,254	8,088	2,130	0	16,472
Greenwood Pk. Community	2,044	21,213	8,953	734	32,944
Groom Peak	483	394	4,326	73	5,276
Happy Jack Wash	488	11,277	4,796	8,973	25,534
Hot Springs	0	924	122	16	1,062
Hualapai Peak	0	157	5,145	0	5,302
JJJ	0	0	303	0	303
Kayser Wash	32	608	0	0	640
Kellis	593	0	874	0	1,467
Kent's Cane Springs	0	2,248	7,992	5,238	15,478
La Cienega	17,063	35,277	6,412	12,551	71,303
Lazy Yu	1,670	6,338	4,325	1,997	14,310
Lines	916	0	11,906	1,400	14,222
Little Cane	3,325	786	1,607	0	5,718
Los Molinos	257	1,028	6,967	9,299	17,551
McElhaney	0	0	5,185	3,995	9,180
Round Valley	416	224	0	0	640
Sandy	381	522	238	0	1,141
Sweetmilk	2,047	1,603	0	0	3,650
Trout Creek	640	0	0	0	640
Walnut Creek	26,397	4,759	15,847	26,403	73,406
White Spring	815	570	0	0	1,385
Wikieup	2,326	0	1,566	4,471	8,363
Yellow Pine	9,560	1,827	10,525	0	21,912
TOTALS	126,309	266,474	287,627	176,339	856,749

CONTINUATION OF PRESENT GRAZING MANAGEMENT

Allotment	Poor[2]	Fair	Good	Excellent	Total
Alamo Crossing	8,539	9,606	2,765	0	20,910
Arrastra Mountain	17,477	4,631	2,659	0	24,767
Artillery Range	43,175	28,653	25	0	71,853
Bagdad	11,088	11,169	3,039	0	25,296
Bateman Spring	12,466	5,320	0	0	17,786
Big Sandy	30,943	11,188	14,512	0	56,643
Black Mesa	3,070	3,898	0	0	6,968
Boriana	9,742	11,020	17,943	0	38,705
Bottleneck Wash	54	80	0	0	134
Burro Creek	496	4,323	0	0	4,819
Burro Creek Ranch	26,794	7,794	0	0	34,588
Byner	1,653	956	1,118	0	3,727
Cane Springs Wash	866	654	0	0	1,520
Chicken Springs	24,641	51,062	8,731	0	84,434
Chino Springs	16,701	2,445	0	0	19,146
Diamond Joe	5,859	4,161	6,229	0	16,249
DOR	1,078	0	0	0	1,078
Fancher Mountain	342	1,592	1,216	0	3,150
Francis Creek	8,984	34,180	6,427	1,366	50,957
Gibson	15,630	1,935	0	0	17,565
Gray Wash	1,753	4,837	1,965	0	8,555
Greenwood Community	14,342	2,130	0	0	16,472
Greenwood Pk. Community	32,210	221	513	0	32,944
Groom Peak	5,203	73	0	0	5,276
Happy Jack Wash	1,808	13,455	1,605	8,666	25,534
Hot Springs	124	800	122	16	1,062
Hualapai Peak	157	5,145	0	0	5,302
JJJ	0	0	303	0	303
Kayser Wash	32	608	0	0	640
Kellis	593	0	874	0	1,467
Kent's Cane Springs	2,248	7,992	5,238	0	15,478
La Cienega	52,340	6,412	12,551	0	71,303
Lazy Yu	7,250	3,444	3,616	0	14,310
Lines	916	11,803	1,441	62	14,222
Little Cane	4,110	1,608	0	0	5,718
Los Molinos	1,285	6,973	8,147	1,146	17,551
McElhaney	0	5,185	3,995	0	9,180
Round Valley	416	224	0	0	640
Sandy	903	238	0	0	1,141
Sweetmilk	2,047	1,603	0	0	3,650
Trout Creek	640	0	0	0	640
Walnut Creek	31,031	15,977	26,398	0	73,406
White Spring	815	570	0	0	1,385
Wikieup	2,322	1,566	4,475	0	8,363
Yellow Pine	11,393	10,519	0	0	21,912
TOTALS	413,598	296,050	135,907	11,194	856,749

ELIMINATION OF LIVESTOCK GRAZING

Allotment	Poor[2]	Fair	Good	Excellent	Total
Alamo Crossing	0	9,413	11,497	0	20,910
Arrastra Mountain	1,162	15,150	4,222	4,233	24,767
Artillery Range	6,734	36,696	28,423	0	71,853
Bagdad	488	10,600	2,532	11,676	25,296
Bateman Spring	1,011	13,593	3,182	0	17,786
Big Sandy	2,604	38,544	2,609	12,886	56,643
Black Mesa	0	3,070	2,151	1,747	6,968
Boriana	861	19,045	4,106	14,693	38,705
Bottleneck Wash	54	80	0	0	134
Burro Creek	21	0	2,984	1,814	4,819
Burro Creek Ranch	2,166	24,628	765	7,029	34,588
Byner	270	1,383	956	1,118	3,727
Cane Springs Wash	152	714	654	0	1,520
Chicken Springs	0	43,527	32,903	8,004	84,434
Chino Springs	2,360	14,341	2,445	0	19,146
Diamond Joe	3,938	3,987	2,095	6,229	16,249
DOR	327	751	0	0	1,078
Fancher Mountain	342	224	1,368	1,216	3,150
Francis Creek	0	8,734	10,630	31,593	50,957
Gibson	3,400	12,230	525	1,410	17,565
Gray Wash	266	4,826	1,801	1,662	8,555
Greenwood Community	2,704	11,638	2,130	0	16,472
Greenwood Pk. Community	1,813	29,576	821	734	32,944
Groom Peak	248	4,955	0	73	5,276
Happy Jack Wash	242	10,013	6,306	8,973	25,534
Hot Springs	0	924	122	16	1,062
Hualapai Peak	0	3,789	1,513	0	5,302
JJJ	0	0	0	303	303
Kayser Wash	0	32	608	0	640
Kellis	0	593	0	874	1,467
Kent's Cane Springs	0	9,658	582	5,238	15,478
La Cienega	17,069	35,266	6,412	12,556	71,303
Lazy Yu	113	7,354	4,866	1,977	14,310
Lines	895	11,725	202	1,400	14,222
Little Cane	3,128	2,590	0	0	5,718
Los Molinos	257	1,706	6,290	9,298	17,551
McElhaney	0	0	5,185	3,995	9,180
Round Valley	32	608	0	0	640
Sandy	381	608	152	0	1,141
Sweetmilk	0	2,500	1,150	0	3,650
Trout Creek	0	640	0	0	640
Walnut Creek	26,397	17,223	3,383	26,403	73,406
White Spring	283	926	176	0	1,385
Wikieup	853	2,843	192	4,475	8,363
Yellow Pine	8,400	13,512	0	0	21,912
TOTALS	88,971	430,215	155,938	181,625	856,749

[1] Projections are for 20 years after implementation.
[2] Units are in acres.

APPENDIX 4-2
REPRESENTATIVE RANCH INCOME STATEMENTS

Item	Ranch Size: Small Short Term	Small Long Term	Medium Short Term	Medium Long Term	Large Short Term	Large Long Term
PROPOSED ACTION						
Revenue	$4,130	$6,938	$13,667	$22,898	$62,469	$102,835
Cash Costs	2 971	3,752	8,890	11,493	53,484	68,720
Net Revenue	$1,159	$3,186	$ 4,777	$11,405	$ 8,985	$ 34,115
Non-Cash Expenses						
Owner-Operator Labor	$1,097	$1,460	$ 9,769	$13,491	$ 9,621	$ 12,884
Depreciation	1,932	2,004	5,411	5,624	19,280	20 146
Total Non-Cash Expenses	$3,029	$3,464	$15,180	$19,115	$28,901	$ 33,030
Net Income	-1,870	- 278	-10,403	- 7,710	-19,916	- 1,085
Herd Size (Cows)	42	56	114	158	512	686
CONTINUATION OF PRESENT GRAZINC MANACEMENT						
Revenue	$6,532	$5,717	$25,338	$22,168	$96,084	$88,474
Cash Costs	4,317	4,010	14,771	13,576	77,649	74,782
Net Revenue	$2,215	$1,707	$10,567	$ 8,592	$18,435	$13,692
Non-Cash Expenses						
Owner-Operator Labor	$1,735	$1,578	$18,111	$16,475	$14,800	$14,185
Depreciation	2,060	2,028	5,892	5,797	20,657	20,491
Total Non-Cash Expenses	$3,795	$3,606	$24,003	$22,272	$35,457	$34,676
Net Income	-1,580	-1,899	-13,436	-13,680	-17,022	- 20,984
Herd Size (Cows)	67	61	212	193	788	755
MODERATE GRAZINC MANACEMENT						
Revenue	$3,706	$5,075	$12,410	$17,414	$56,678	$78,592
Cash Costs	2,729	2,974	8,264	9,679	49,694	56,647
Net Revenue	$ 977	$2,101	$ 4,146	$ 7,735	$ 6,984	$21,945
Non-Cash Expenses						
Owner-Operator Labor	$ 985	$1,098	$ 8,870	$10,891	$ 8,729	$10,299
Depreciation	1,909	1,932	5,359	5,475	19,043	19,460
Total Non-Cash Expenses	$2,894	$3,030	$14,229	$16,366	$27,772	$ 29,759
Net Income	-1,917	- 929	-10,083	- 8,631	-20,788	- 7,814
Herd Size (Cows)	38	42	103	127	464	548
WILDLIFE ENHANCEMENT						
Revenue	$3,007	$5,294	$10,860	$18,737	$49,931	$82,918
Cash Costs	2,324	2,999	7,491	9,779	44,471	57,069
Net Revenue	$ 683	$2,295	$ 3,369	$ 8,958	$ 5,460	$25,849
Non-Cash Expenses						
Owner-Operator Labor	$ 799	$1,114	$ 7,763	$11,039	$ 7,689	$10,389
Depreciation	1,872	1,935	5,295	5,484	18,768	19,484
Total Non-Cash Expenses	$2,671	$3,049	$13,058	$16,523	$26,457	$29,873
Net Income	-1,988	- 754	- 9,689	- 7,565	-20,997	- 4,024
Herd Size (Cows)	31	43	91	129	409	553
ELIMINATION OF LIVESTOCK CRAZINC						
Revenue	$1,254	$1,254	$6,034	$6,034	$38,691	$38,691
Cash Costs	1,166	1,166	4,331	4,331	36,205	36,205
Net Revenue	$ 88	$ 88	$1,703	$1,703	$ 2,486	$ 2,486
Non-Cash Expenses						
Owner-Operator Labor	$ 333	$ 333	$4,313	$4,313	$ 5,960	$ 5,960
Depreciation	1,778	1,778	5,096	5,096	16,838	16,838
Total Non-Cash Expenses	$2,111	$2,111	$9,409	$9,409	$22,798	$22,798
Net Income	-2,023	-2,023	-7,706	-7,706	-20,312	- 20,312
Herd Size (Cows)	13	13	50	50	317	317

APPENDIX 4-3
TOTAL ANNUAL RANCH RECEIPTS, EXPENDITURES, AND REVENUE

Item	Ranch Size: Small Short Term	Small Long Term	Medium Short Term	Medium Long Term	Large Short Term	Large Long Term	EIS Area Total Short Term	EIS Area Total Long Term
PROPOSED ACTION								
Number of Ranches	10 **	10	10	10	10	10	10	10
Receipts								
Per Ranch	$ 4,130	$ 6,938	$ 13,667	$ 22,898	$ 62,469	$ 102,835	—	--
EIS Area Total*	41,300	69,380	136,670	228,980	624,690	1,028,350	$802,660	$1,326,710
Expenditures								
Per Ranch	2,971	3,752	8,890	11,493	53,484	68,720	—	--
EIS Area Total*	29,710	37,520	88,900	114,930	534,840	687,200	653,450	839,650
Net Return								
Per Ranch	1,159	3,186	4,777	11,405	8,985	34,115	—	--
EIS Area Total*	11,590	31,860	47,770	114,050	89,850	341,150	149,210	487,060
CONTINUATION OF PRESENT MANAGEMENT								
Number of Ranches	10 **	10	10	10	10	10	10	10
Receipts								
Per Ranch	$ 6,532	$ 5,717	$ 25,338	$ 22,168	$ 96,084	$ 88,474	—	—
EIS Area Total*	65,320	57,170	253,380	221,680	960,840	884,740	$1,279,540	$1,163,590
Expenditures								
Per Ranch	4,317	4,010	14,771	13,576	77,649	74,782	—	—
EIS Area Total*	43,170	40,100	147,710	135,760	776,490	747,820	967,370	923,680
Net Return								
Per Ranch	2,215	1,707	10,567	8,592	18,435	13,692	—	—
EIS Area Total*	22,150	17,070	105,670	85,920	184,350	136,920	312,170	239,910
MODERATE GRAZING MANAGEMENT								
Number of Ranches	10 **	10	10	10	10	10	10	10
Receipts								
Per Ranch	$ 3,706	$ 5,075	$ 12,410	$ 17,414	$ 56,678	$ 78,592	—	—
EIS Area Total*	37,060	50,750	124,100	174,140	566,780	785,920	$727,940	$1,010,810
Expenditures								
Per Ranch	2,729	2,974	8,264	9,679	49,694	56,647	—	—
EIS Area Total*	27,290	29,740	82,640	96,790	496,940	566,470	606,870	693,000
Net Return								
Per Ranch	977	2,101	4,146	7,735	6,984	21,945	—	—
EIS Area Total*	9,770	21,010	41,460	77,350	69,840	219,450	121,070	317,810
WILDLIFE ENHANGEMENT								
Number of Ranches	10 **	10	10	10	10	10	10	10
Receipts								
Per Ranch	$ 3,007	$ 5,294	$ 10,860	$ 18,737	$ 49,931	$ 82,918	—	—
EIS Area Total*	30,070	52,940	108,600	187,370	499,310	829,180	$637,980	$1,069,490
Expenditures								
Per Ranch	2,324	2,999	7,491	9,779	44,471	57,069	—	—
EIS Area Total*	23,240	29,990	74,910	97,790	444,710	570,690	542,860	698,470
Net Return								
Per Ranch	683	2,295	3,369	8,958	5,460	25,849	—	—
EIS Area Total*	6,830	22,950	33,690	89,580	54,600	258,490	95,120	371,020
ELIMINATION OF LIVESTOCK GRAZING								
Number of Ranches	10**	10	10	10	10	10	10	10
Receipts								
Per Ranch	$ 1,254	$ 1,254	$ 6,034	$ 6,034	$ 38,691	$ 38,691	—	—
EIS Area Total*	12,540	12,540	60,340	60,340	386,910	386,910	$459,790	$459,790
Expenditures								
Per Ranch	1,166	1,166	4,331	4,331	36,205	36,205	—	—
EIS Area Total*	11,660	11,660	43,310	43,310	362,050	362,050	417,020	417,020
Net Return								
Per Ranch	88	88	1,703	1,703	2,486	2,486	—	—
EIS Area Total*	880	880	17,030	17,030	24,860	24,860	42,770	42,770

* Represents the per ranch figure multiplied by the number of ranchers in each size class.
Source: Hualapai-Aquarius PAA (BLM, 1980).

** The EIS area actually contains 31 ranch operations. Since the DOR Ranch, a small operation, is strictly ephemeral and not typical of ranches in the area, it was not used in this analysis.

APPENDIX 4-4
RANCH EMPLOYMENT AND EARNINGS

Item	Ranch Size: Small Short Term	Small Long Term	Medium* Short Term	Medium* Long Term	Large Short Term	Large Long Term	EIS Area Total Short Term	EIS Area Total Long Term
PROPOSED ACTION								
Number of Ranches	10**	10	10	10	10	10	10	10
Labor Requirements (Hours per Year)								
Per Ranch	296	395	1,372	3,195	5,377	7,433	—	—
EIS Area Total	2,960	3,950	13,720	31,950	53,770	74,330	70,450	110,230
Employment (Workyears - 1 Workyear = 2,600 Hours)								
Per Ranch	0.11	0.15	0.53	1.23	2.07	2.86	—	—
EIS Area Total	1.14	1.52	5.28	12.29	20.68	28.59	27.10	42.40
Income ($9,620 per Workyear)								
Per Ranch	$ 1,058	$ 1,443	$ 5,099	$ 11,833	$ 19,913	$ 27,513	—	—
EIS Area Total	10,967	14,622	50,794	118,230	198,942	275,035	$260,702	$407,888
CONTINUATION OF PRESENT GRAZING MANAGEMENT								
Number of Ranches	10**	10	10	10	10	10	10	10
Labor Requirements (Hours per Year)								
Per Ranch	469	426	3,415	2,460	8,538	8,182	—	—
EIS Area Total	4,690	4,260	34,150	24,600	85,380	81,820	124,220	110,680
Employment (Workyears - 1 Workyear = 2,600 Hours)								
Per Ranch	0.18	0.16	1.31	0.95	3.28	3.15	—	—
EIS Area Total	1.80	1.64	13.13	9.50	32.84	31.50	47.77	42.64
Income ($9,620 per Workyear)								
Per Ranch	$ 1,735	$ 1,578	$ 12,602	$ 9,139	$ 31,590	$ 30,303	—	—
EIS Area Total	17,353	15,780	126,378	91,390	315,906	303,030	$459,637	$410,200
MODERATE GRAZING MANAGEMENT								
Number of Ranches	10**	10	10	10	10	10	10	10
Labor Requirements (Hours per Year)								
Per Ranch	264	297	1,194	2,181	5,032	5,940	—	—
EIS Area Total	2,640	2,970	11,940	21,810	50,320	59,400	64,900	84,180
Employment (Workyears - 1 Workyear = 2,600 Hours)								
Per Ranch	0.10	.11	0.46	0.84	1.94	2.28	—	—
EIS Area Total	1.02	1.14	4.59	8.39	19.35	22.85	24.96	32.38
Income ($9,620 per Workyear)								
Per Ranch	$ 962	$ 1,058	$ 4,425	$ 8,081	$ 18,663	$ 21,934	—	—
EIS Area Total	9,812	10,967	44,156	80,712	186,147	219,817	$240,115	$311,496
WILDLIFE ENHANCEMENT								
Number of Ranches	10**	10	10	10	10	10	10	10
Labor Requirements (Hours per Year)								
Per Ranch	185	301	975	2,513	3,831	5,993	—	—
EIS Area Total	1,850	3,010	9,750	25,130	38,620	59,930	50,220	88,070
Employment (Workyears - 1 Workyear = 2,600 Hours)								
Per Ranch	0.07	0.12	0.38	0.97	1.47	2.31	—	—
EIS Area Total	0.71	1.16	3.75	9.67	14.85	23.05	19.32	33.87
Income ($9,620 per Workyear)								
Per Ranch	$ 673	$ 1,154	$ 3,656	$ 9,331	$ 14,142	$ 22,222	—	—
EIS Area Total	6,830	11,159	36,075	93,025	142,857	221,741	$185,858	$325,829
ELIMINATION OF LIVESTOCK GRAZING								
Number of Ranches	10**	10	10	10	10	10	10	10
Labor Requirements (Hours per Year)								
Per Ranch	24	24	496	496	2,498	1,278	—	—
EIS Area Total	240	240	4,960	4,960	24,980	12,780	30,180	30,180
Employment (Workyears - 1 Workyear = 2,600 Hours)								
Per Ranch	0.01	0.01	0.19	0.19	0.96	0.96	—	—
EIS Area Total	0.09	0.09	1.91	1.91	9.60	9.60	11.60	11.60
Income ($9,620 per Workyear)								
Per Ranch	$ 96	$ 96	$ 1,828	$ 1,828	$ 9,235	$ 9,235	—	—
EIS Area Total	866	866	18,374	18,374	92,350	92,350	$111,590	$111,590

* On the medium size ranch the total value of family labor is $4,313, however this ranch does not have enough net revenue to cover the total labor expense. Thus, only $1,703 worth of family labor is included in this analysis.

** The EIS area actually contains 31 ranch operations. Since the DOR Ranch, a small operation, is strictly ephemeral and not typical of ranches in the area, it was not used in this analysis.

GLOSSARY, REFERENCES, AND INDEX

MUTTONGRASS

GLOSSARY

ABBREVIATIONS

The following abbreviations are used in this EIS. Those representing terms are defined in the glossary.

ACEC	area of critical environmental concern
AG&FD	Arizona Game and Fish Department
AMP	allotment management plan
AUF	allowable use factor
AUM	animal unit month
BLM	Bureau of Land Management
EA	environmental assessment
EIS	environmental impact statement
FWS	Fish and Wildlife Service
HMAP	herd management area plan
HMP	habitat management plan
MFP	management framework plan
ORV	off-road vehicle
PMOA	programmatic memorandum of agreement
PUF	proper use factor
SCS	Soil Conservation Service
SEP	social-economic profile
SEPA	social-economic profile area
SLD	Arizona State Land Department
SSF	soil surface factor
TDS	total dissolved solids
URA	unit resource analysis
USDA	U.S. Department of Agriculture
VRM	visual resource management
WSA	wilderness study area

TERMS

ACCELERATED EROSION. Soil movement or loss exceeding normal geologic erosion, which is caused by human disturbances.

ACRE-FOOT. A volume that will cover an area of 1 acre to a depth of 1 foot (43,560 cubic feet).

ACTUAL USE. The actual amount of livestock grazing in AUMs based on the numbers of livestock and grazing dates submitted by a livestock operator and confirmed by BLM's periodic field checks.

ALLOTMENT. An area where one or more operators graze their livestock. It generally consists of public lands but may include parcels of private and State-owned lands. BLM stipulates the number of livestock and season of use for each allotment. An allotment may consist of one or several pastures.

ALLOTMENT MANAGEMENT PLAN (AMP). A livestock grazing management plan dealing with a specific unit of rangeland, based on multiple-use resource management objectives. The AMP considers livestock grazing in relation to other uses of the range and in relation to renewable resources—watershed, vegetation, and wildlife. An AMP establishes seasons of use, number of livestock to be permitted on the range, and rangeland developments needed.

ALLOWABLE USE FACTOR (AUF). The percent of the annual growth of a plant species that could be removed and still allow the species to regenerate itself. See Proper Use Factor.

ALLUVIAL. Pertaining to sediments transported and deposited by water.

ALLUVIAL FAN. A sloping, fan-shaped mass of sediment deposited by a stream where it emerges from an upland onto a plain.

ALLUVIAL SOIL. A soil formed from recently deposited alluvium and having essentially no horizon development nor modification of recently deposited materials.

ALLUVIUM. Unconsolidated rock or soil material deposited by running water, including gravel, sand, silt, clay, and various mixtures of these.

ANDESITE. A volcanic rock, made up primarily of plagioclase feldspar.

ANIMAL UNIT MONTH (AUM). The amount of forage necessary for the sustenance of one cow or its equivalent for a period of 1 month.

ANNUAL PLANT. A plant that completes its life cycle and dies in 1 year or less (Range Term Glossary Committee, 1974).

AQUIFER. A water-bearing bed or layer of permeable rock, sand, or gravel, capable of yielding large amounts of water.

AREA OF CRITICAL ENVIRONMENTAL CONCERN (ACEC). A public land area where special management attention is required to protect life from natural hazards or to protect and prevent irreparable damage to important historic, cultural, or scenic values or to fish, wildlife, or natural systems or processes.

ARIZONA NATURAL HERITAGE PROGRAM. A cooperative effort of the Nature Conservancy and the Arizona Game and Fish Department to maintain Arizona's biological diversity by collecting, analyzing, and disseminating information on the populations and distributions of plants and animals of special interest in the State. Being studied are Arizona species that are poorly understood and species with low populations or limited distribution within Arizona.

ASPECT (VEGETATION). The appearance that a dominant or most common species of vegetation gives to the viewer.

AUTHORIZED GRAZING PREFERENCE (QUALIFICATIONS). The total number of AUMs that livestock annually are allowed to graze on public lands. Preference is apportioned and attached to base property owned or controlled by a permittee or lessee.

AVERAGE LICENSED USE (5 YEARS). Annual licensed use averaged over the past 5 years, representing a more realistic number of yearly AUMs consumed than just the past year's licensed use.

BASALT. A fine-grained igneous rock dominated by dark colored minerals, consisting of over 50 percent plagioclase feldspars and the remainder ferromagnesian silicates.

BASE FLOW. The portion of the water flowing in a stream that originates from ground water seepage into the channel.

BENEFIT-COST ANALYSIS. An analytical approach to solving problems of choice, which identifies for each objective the alternative yielding the greatest benefit for a given cost or the alternative producing the required level of benefits at the lowest cost.

GLOSSARY

BENTONITE. A clay formed by the decomposition of volcanic ash, having the ability to absorb large quantities of water and to expand to several times its normal volume.

BROOD COW. A cow used for breeding.

BROWSE. The tender shoots, twigs, and leaves of trees, shrubs, and woody vines often used as food by cattle, deer, elk, and other animals; to consume browse.

CALCAREOUS SOIL. A soil containing enough calcium carbonate to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

CALF CROP. The number of calves weaned from a given number of cows bred, usually expressed as a percentage (Range Term Glossary Committee, 1974).

CANOPY. The cover of leaves and branches formed by the crowns of plants.

CARRYING CAPACITY (GRAZING CAPACITY). The maximum stocking rate possible without damage to vegetation or related resources. Carrying capacity may vary from year to year in the same area because of fluctuating forage production (Range Term Glossary Committee, 1974).

CATTLE YEARLONG (CYL). The amount of forage necessary to sustain one cow for a 1-year period. One CYL equals 12 AUMs.

CHANNEL EROSION. Erosion occurring in the bottom of gullies that are more than 1 foot deep. See Upland Erosion.

CLIMAX. The highest ecological development of a plant community capable of perpetuation under the prevailing climate and soil conditions.

COBBLE. A generally rounded rock fragment between 3 and 10 inches in diameter.

COLIFORM. A group of bacterial normally present in the intestinal tracts of warm-blooded animals, which are used as an indicator of the sanitary quality of water.

CONTROLLED LAND. In this EIS, land other than BLM-administered public lands that a rancher either owns or leases for grazing. Controlled land may include State land.

COOL-SEASON PLANT. A plant whose major growth period occurs during spring and summer. See Warm-Season Plant.

COOPERATIVE AGREEMENT. An agreement issued by BLM for the construction of a rangeland development on public lands. Under a cooperative agreement both BLM and the permittee have an interest in the project, but BLM retains its ownership. This agreement also spells out who will maintain the project.

COW-CALF LIFESTOCK OPERATION. A livestock operation that maintains a base breeding herd of mother cows and bulls. The cows produce a calf crop each year, and the operation keeps some heifer calves from each crop for breeding herd replacements. The operation sells the rest of the calf crop between the ages of 6 and 12 months along with old or nonproductive cows and bulls (cull cows).

COW YEARLONG. See Cattle Yearlong.

CRITICAL GROWTH PERIOD. The period in a plant's growth cycle when food reserves are lowest and grazing is most harmful.

CRITICAL WILDLIFE HABITAT. That part of the habitat of a federally protected wildlife species that is essential to its survival and perpetuation.

CRUCIAL WILDLIFE HABITAT. That part of the habitat of a wildlife species that is essential to its survival and perpetuation as a population.

CULL COWS. Old and nonproductive cows and bulls removed from the breeding stock of a livestock operation. The percentage of cows culled is an indicator of performance, the lower the percentage the more stable the operation.

CULTURAL RESOURCE INVENTORY CLASSES.
CLASS I - library, archival, and literature research with consultation to identify known cultural resources.
CLASS II - a field inventory of an area, systematically designed to provide a predictive model of the nature and distribution of the cultural resources in the area.
CLASS III - an intensive field search of all surface-evident cultural resources for an entire area.

CULTURAL RESOURCE SITE. A physical location of past human activities or events. Sites vary in size, ranging from the location of a single cultural resource object to a cluster of cultural resource structures with associated objects and features.

CULTURAL RESOURCES. Those fragile and nonrenewable remains of human activity, occupation, or endeavor, reflected in districts, sites, structures, buildings, objects, artifacts, ruins, works of art, architecture, and natural features, which were of importance in human events. These resources consist of (1) physical remains, (2) areas where significant human events occurred—even though evidence of the event no longer remains, and (3) the environment immediately surrounding the actual resource.

DISCLIMAX. A biotic community whose stability is maintained by humans or their domestic animals. Such a community is thus prevented from reaching a climax.

ECOTONE. A transition line or strip of vegetation between two communities, having characteristics of both kinds of neighboring vegetation as well as characteristics of its own (Soil Conservation Society of America, 1970).

ENDANGERED ANIMAL SPECIES. Any animal species in danger of extinction throughout all or a significant portion of its range. This definition excludes species of insects that the Secretary of the Interior determines to be pests and whose protection under the Endangered Species Act of 1973 would present an overwhelming and overriding risk to man.

ENDANGERED PLANT SPECIES. Species of plants in danger of extinction throughout all or a significant portion of their ranges. Existence may be endangered because of the destruction, drastic change, or severe curtailment of habitat, or because of overexploitation, disease, predation, or unknown reasons. See Threatened Plant Species and Sensitive Plant Species.

ENVIRONMENT. The surrounding conditions, influences, or forces that affect or modify an organism or an ecological community and ultimately determine its form and survival.

ENVIRONMENTAL ASSESSMENT (EA). The procedure for analyzing the impacts of some proposed action on a given environment and the documentation of that analysis. An EA is similar to an environmental impact statement (EIS) except it is generally smaller in scope. An EA may be preliminary to an EIS.

ENVIRONMENTAL IMPACT STATEMENT (EIS). An analytical document developed for use by decisionmakers to weigh the environmental consequences of a potential decision. An EIS should accurately portray potential impacts on the human environment of a particular course of action and its possible alternatives.

EPHEMERAL ALLOTMENT. An allotment on which livestock grazing is permitted when sufficient precipitation and temperatures provide the *potential* for the growth of abundant annual (ephemeral) vegetation. See Perennial-Ephemeral Allotment.

EPHEMERAL RANGELAND. Rangeland that does not consistently produce forage but periodically provides annual vegetation suitable for livestock grazing.

EPHEMERAL STREAMS. Streams flowing during rainstorms or peak snowmelt, whose channels are poorly defined and whose flow usually lasts less than 10 percent of the year.

EROSION. The wearing away of the land surface by wind, water, and other geological agents; the process by which water and wind detach and remove soil particles.

EXCLOSURE. A small area set aside and protected from grazing either to preserve representative areas in excellent range condition or to allow observation of succession on depleted rangeland without grazing (Rangeland Reference Area Committee, 1975).

EROSION CONDITION CLASSES. A classification system for soil erosion, which ranks a site on a scale of 0 to 100 in increments of 20 points. Value classes are as follows: 0–20 stable; 21–40 slight; 41–60 moderate; 61–80 critical; 81–100 severe.

ETHNOGRAPHIC. Pertaining to the scientific description of individual cultures.

FEDERAL LAND POLICY AND MANAGEMENT ACT OF 1976 (FLPMA). Public Law 94-579, which gives BLM the legal authority to establish public land policy; to establish guidelines for administering such policy; and to provide for the management, protection, development, and enhancement of the public lands.

FORAGE. All browse and herbaceous foods available to grazing animals, which may be grazed or harvested for feeding (Range Term Glossary Committee, 1974).

FORB. An herbaceous plant that is not a grass, sedge, or rush (Soil Conservation Society of America, 1970).

FRIGID SOIL. A soil whose mean annual temperature at 50 centimeters depth is below 47 °F. In Arizona frigid soils usually occur above 7,500 feet in elevation.

GNEISS. A metamorphic rock made up of bands of differing color and mineral composition.

GRASSLAND. Land whose vegetation is dominated by grasses, grasslike plants, and forbs. For nonforest land to be classified as grassland, herbaceous vegetation must constitute at least 80 percent of the canopy cover excluding trees (Artz, 1980).

GRAVEL. Generally rounded rock fragments between 2 and 74 millimeters in diameter.

GRAZE. To feed on herbage.

GRAZING SYSTEM. A systematic application of grazing treatments to a management unit in a prescribed sequence over recurring periods of time; the manipulation of livestock to accomplish a desired result.

GROUND COVER (SOIL). Vegetation, litter, erosion pavement, and rocks covering the soil and providing protection from or resistance to the impact of raindrops. Ground cover is expressed as a percentage of the area covered.

HABITAT. A specific set of physical conditions that surround the single species, a group of species, or a large community. In wildlife management, the major components of habitat are considered to be food, water, cover, and living space.

HABITAT MANAGEMENT PLAN (HMP). A written and officially approved plan for a specific geographical area of public land that identifies wildlife habitat and related objectives, establishes the sequence of actions for achieving objectives, and outlines procedures for evaluating accomplishments.

HERBACEOUS. Pertaining to plants having little or no woody tissue.

HERBAGE. Herbaceous vegetation (as grass), especially when used for grazing.

HERBIVORE. An animal that feeds exclusively on plants.

HERD MANAGEMENT AREA PLAN (HMAP). Plan for the management of a geographic area used by wild horses or burros. HMAPs outline details of burro or horse capture plans, adoption programs, and long-term management of populations.

IGNEOUS. Rock of interlocking minerals formed by the cooling and solidification of molten material beneath or within the earth's crust.

INFILTRATION. The movement of water into soil through pores or other openings.

INTENSIVE GRAZING MANAGEMENT. A livestock management program that is based on the multiple-use resource management concept and that implements a specified grazing system formulated in an AMP.

INTRUSION (VISUAL RESOURCES). A feature (land, vegetation, or structure) that is generally considered out of context with the characteristic landscape.

KEY AREAS. Representative areas in a pasture used as sites for evaluation studies to monitor rangeland condition and trend.

KEY SPECIES. A plant that is relatively or potentially abundant, that is able to endure moderately close grazing, and that serves as an indicator of changes occurring in a vegetational complex. The key species is an important vegetation component, which, if overused, will significantly affect watershed conditions, grazing capacity, or other resources. More than one key species may be selected on an allotment. One species may be important for watershed protection, and a different species may be important for livestock or wildlife forage or other values.

LESS INTENSIVE GRAZING MANAGEMENT. Management recommended for allotments where projected benefits to multiple resources are not high enough to justify the costs of an intensive grazing system. Under less intensive grazing management, BLM would set numbers and kind of livestock and period of use on all lands in the allotment.

LIME (LIMY). Chemically, lime is calcium oxide. As commonly used, however, lime also refers to calcium carbonate hydroxide. When present in visible amounts, lime is referred to as caliche.

LIMEPAN. A hardened layer of sandy or clayey soil material cemented by calcium carbonate.

LIMITING FACTOR. The quality or quantity of a habitat component (food, water, cover, or space) that keeps a wildlife population at a certain level. If the limiting factor has improved or increased, the population can increase until another limiting factor impinges.

LITTER. A surface layer of loose organic debris consisting of freshly fallen or slightly decomposed organic materials (Soil Conservation Society of America, 1970).

LITHIC SITE. A site containing debris left from the manufacture, use, or maintenance of flaked stone tools.

LIVESTOCK OPERATOR. In this EIS, an individual, family, corporation, or other entity that runs a livestock operation. An operator may have a single allotment, more than one allotment, or a portion of an allotment.

LIVESTOCK PERFORMANCE. The efficiency of livestock within an operation, as measured by such indicators as calf crop, weaned calf weights, animal death rates, and percent culled cows.

LIVESTOCK PRODUCTION. The weight and number of animals that a particular range, pasture, or management system produces (Range Term Glossary Committee, 1974).

MAINTENANCE LEVEL. The smallest number of individuals in a population needed to maintain its existence. If a population drops below its maintenance level, it will die out.

MANAGEMENT FRAMEWORK PLAN (MFP). A land use plan for public lands that provides a set of goals, objectives, and constraints for a specific planning area to guide the development of detailed plans for the management of each resource.

MESA. A broad, nearly flat-topped and usually isolated upland mass.

METAMORPHIC ROCK. Rock whose structure or constitution has changed (often to a harder and more completely crystalline state) due to natural agencies, such as heat and pressure.

MULTIPLE-USE MANAGEMENT. The management of the public land and its resources to allow their use in a combination to best meet the needs of the American people and ensure balanced and diverse resource use.

NATIONAL REGISTER OF HISTORIC PLACES. The official list, established by the Historic Preservation Act of 1966, of the Nation's cultural resources worthy of preservation. The Register lists archaeological, historic, and architectural properties (districts, sites, building, structures, and objects) nominated for their local, State, or national significance by State or Federal agencies and approved by the National Register staff. The Register is maintained by the Heritage Conservation and Recreation Service of the Department of the Interior.

NATURAL AREA. Lands managed for retention of their typical or unusual plant or animal types, associations, or other biotic phenomena; or their outstanding scenic, geologic, pedologic, or aquatic features or processes.

NONINTENSIVE GRAZING MANAGEMENT (CUSTODIAL). A limited form of rangeland management employed when the percentage of public land is small, when public land is scheduled to be transferred from public ownership, or when other conditions are not conducive to intensive management. Under nonintensive management, an allottee is not required to follow a specified grazing system, but BLM specifies livestock numbers, type of animal, and grazing season on public lands only.

OFF-ROAD VEHICLE (ORV). Any motorized vehicle designed for or capable of cross-country travel on or immediately over land, water, sand, snow, ice, marsh, swampland or other natural terrain, excluding (a) any registered motorboat, (b) any fire, military, emergency, or law enforcement vehicle when used for emergencies and any combat or combat support vehicle when used for national defense, and (c) any vehicle whose use is expressly authorized by the respective agency head under a permit, lease, license, or contract.

OPERATOR. See Livestock Operator.

OVERSTORY. The layer of foliage in a tree canopy.

PASTURE. A grazing area enclosed and separated from other areas by fences or natural barriers.

PERENNIAL-EPHEMERAL ALLOTMENT. An allotment where livestock are permitted to graze perennial vegetation but where additional livestock grazing may be authorized should sufficient annual (ephemeral) forage be present. See Ephemeral Allotment.

PERENNIAL PLANT. A plant that has a life cycle of 3 or more years (Range Term Glossary Committee, 1974).

PERENNIAL STREAM. A stream that flows throughout the year.

PERMITTEE. See Livestock Operator.

PHENOLOGY (PHENOLOGIES). The study of the timing or sequence of periodic biological phenomena, such as flowering or seeding, especially as related to climate.

PLANNING AREA ANALYSIS (PAA). A BLM planning document, analyzing social, economic, institutional, infrastructural, and environmental factors and establishing economic demand projections for a planning area. Data and analysis in PAAs are used for preparing management framework plans (MFPs).

PREFERENCE. See Active Preference.

PRESCRIBED BURNING. The intentional burning of the wildland fuels of a predetermined area under proper weather, fuel moisture, and soil moisture conditions to achieve planned benefits with the least damage at acceptable costs.

PROPER USE FACTOR (PUF). The percent of the annual growth of a plant species an animal would prefer to eat if the rest of the range is not overgrazed; an estimate of animal forage preference.

PUBLIC LAND. Federal lands administered by the Bureau of Land Management.

RANCH VALUE. The value of privately owned land combined with the value of the right to use AUMs on Federal and State lands.

RANGELAND SITE. A distinctive kind of rangeland, which because of soil, climate, topography, or other natural factors, differs from other kinds in its ability to produce a characteristic natural plant community. Rangeland sites are considered as units for purposes of discussion, investigation, and management.

RANGELAND (RANGE). Land dominated by vegetation that can be grazed or browsed and whose husbandry is provided routinely through grazing management instead of renovation or cultural treatment.

RANGELAND CONDITION. The state of health of rangeland based on what the rangeland is naturally capable of producing.

RANGELAND DEVELOPMENT (RANGE IMPROVEMENT). A structure, development, or treatment used in concert with management (1) to rehabilitate, protect, and improve public land and its resources; (2) to arrest rangeland deterioration; and (3) to improve forage condition, fish and wildlife habitat, watershed protection, and livestock production, all consistent with land use plans.

RANGELAND MANAGEMENT PROGRAM DOCUMENT. The document in which BLM officially announces its decision for a rangeland management program from among the alternatives analyzed in an EIS. The document discusses the other alternatives considered as well as the rationale for, projected benefits of, and implementation of the selected alternative.

RANGELAND READINESS. That point in a plant's growth cycle at which grazing may begin without permanently damaging vegetation and soil.

REASONABLE NUMBERS (WILDLIFE). The populations of big game that public lands can support as agreed to by the Arizona Game and Fish Department and BLM. In this grazing EIS, reasonable numbers correspond to the present estimated carrying capacity for mule deer, javelina, elk, pronghorn antelope, and desert bighorn sheep.

RELICT. A remnant of plant life from a time when the plant life was more widely distributed.

RESIDUAL IMPACT. The adverse impact of an action occurring after application of all mitigating measures.

RESIDUUM. Soil material that has developed in place from underlying rocks and is rarely transported to another site.

REST. Any period during which no livestock grazing is allowed within a range unit.

RHYOLITE. A silica-rich fine-grained igneous rock of volcanic origin.

RIPARIAN. Situated on or pertaining to the bank of a river, stream, or other body of water. Riparian is normally used to refer to the plants of all types that grow along streams or around springs.

ROCK OUTCROP. Bedrock exposures or patches of thin soil over bedrock.

RUNOFF. A general term used to describe the portion of precipitation on the land that ultimately reaches a stream. Runoff may include channel and nonchannel flows.

SALVAGE (ARCHAEOLOGICAL). The recovery of material and data from an affected resource before its alteration or destruction, through recordation, documentation, partial or total excavation, and collection for analysis and interpretation.

SCHIST. Any of various medium- to coarse-grained metamorphic rocks composed of laminated, often flaky, parallel layers of chiefly micaceous minerals.

SECONDARY SUCCESSION. See Succession.

SEDIMENT YIELD. The volume of soil moved from its point of origin to another point on the earth's surface.

SENSITIVE ANIMAL SPECIES. Animals whose populations are consistently small and widely dispersed, or whose ranges are restricted to a few localities, such that any appreciable reduction in numbers, habitat availability, or habitat condition might lead toward extinction. See Endangered Animal Species and Threatened Animal Species.

SENSITIVE PLANT SPECIES. Plants whose populations are consistently small and widely dispersed or whose ranges are restricted to a few localities, such that any appreciable reduction in numbers, habitat availability, or habitat condition might lead toward extinction. Sensitive plants also include species rare in one locality (such as in Arizona) but abundant elsewhere. See Endangered Plant Species and Threatened Plant Species.

SHRUB. A relatively low-growing, muchbranched, many-stemmed woody perennial plant.

SOCIAL-ECONOMIC PROFILE (SEP). An information document for use in BLM planning and decisionmaking. The SEP describes the social and economic characteristics of the human population and analyzes and records the economic, social, historical, and public coordination data for the social-economic profile area (SEPA).

SOCIAL-ECONOMIC PROFILE AREA (SEPA). A region or area of similar social, economic or institutional characteristics for which a social-economic profile (SEP) is prepared. A SEPA represents an area whose external or spillover effects with other areas are not significant.

SOCIOCULTURAL RESOURCES. Places, objects, structures, and things of importance to a subgroup or population at large. Included are values that reflect the concepts, religion, social heritage, habits, skills, arts, and lifestyles of a given people.

SOIL ASSOCIATION. A group of defined and named kinds of soils associated together in a characteristic geographic pattern.

SOIL MOISTURE. Water stored with the soil, which is available for plant uptake (transpiration) and evaporation to the atmosphere. Each soil has a characteristic capacity for holding moisture. When this capacity is reached, water cannot infiltrate the soil but instead runs off, increasing the probability of flooding.

SOIL PERMEABILITY. The characteristic of soil that enables water and air to move through it. The permeability of a soil may be limited by the presence of one nearly impermeable layer even though others are permeable.

SOIL REACTION, pH. The degree of acidity or alkalinity of a soil expressed in pH values. A soil that tests a pH of 6.6 to 7.3 is considered neutral in reaction, being neither acid nor alkaline. An acid or sour soil tests below 6.6, and an alkaline soil tests over 7.3.

SOIL SURFACE FACTOR (SSF). A numerical expression of surface erosion caused by wind and water as reflected by soil movement, surface litter, erosion, pavement, pedestalling, rills, flow patterns, and gullies. Values vary from zero for no erosion condition to 100 for a severe condition.

SOIL TEXTURE. The relative proportions of sand, silt, and clay particles in a mass of soil. The different texture classes are commonly referred to in general terms as follows:

sands, loamy sands	coarse-textured soils	
sandy loam fine sandy loam	moderately coarse-textured soils	sandy soils
very fine sandy loam, loam, silt loam, silt	medium-textured soils	loamy soils
sandy clay, silty clay, clay	fine-textured soils	clayey soils

SOIL VARIANT. A taxonomic soil unit that is closely related to another taxonomic unit but departs from it in at least one differentiating characteristic at the series level. The Hayhook variant used in soil association 1, for example, is calcareous as opposed to the typical nonacid Hayhook series.

SPECIES COMPOSITION. The proportions of individual plant species in relation to the total of a given area.

STATE HISTORIC PRESERVATION OFFICER (SHPO). The official within each State, authorized by the State at the request of the Secretary of the Interior, to act as a liaison for implementing the National Historic Preservation Act of 1966.

STATE-LISTED SPECIES. A plant or animal species classified by a State government, under State laws and regulations, in categories implying potential extinction throughout all or a significant portion of its range, especially extirpation within the State.

STOCKING RATE (LEVEL). Number of grazing animals on a given area of land at any time. The stocking rate may be above, below, or equal to the proper carrying capacity.

STONE. A rock fragment larger than 10 inches in diameter.

SUBCLIMAX. A stage in the ecological succession of a plant or animal community immediately before climax that is maintained by the effects of fire, flood, or other conditions.

SUCCESSION. An orderly process of biotic community development that involves changes in species, structure, and community processes with time. It is reasonably directional and therefore predictable. Secondary succession is this process occurring after disturbance.

SUSTAINED YIELD. Achieving and maintaining a permanently high level, annual or regular period production of the various renewable land resources without impairing the productivity of the land and its environmental values.

THREATENED ANIMAL SPECIES. Any animal species likely to become endangered within the foreseeable future throughout all or a significant part of its range. See Endangered Animal Species and Sensitive Animal Species.

THREATENED PLANT SPECIES. Species of plants that are likely to become endangered within the foreseeable future through all or a significant portion of their ranges, including species categorized as rare, very rare, or depleted. See Endangered Plant Species and Sensitive Plant Species.

TOTAL DISSOLVED SOLIDS (TDS). Salt—an aggregate of carbonates, bicarbonates, chlorides, sulfates, phosphates, and nitrates of calcium, magnesium, manganese, sodium, potassium, and other cations that form salts. High TDS solutions can change the chemical nature of water, exert varying degrees of osmotic pressures, and often become lethal to life in an aquatic environment.

TRAILING. Controlled directional movement of livestock. Natural trailing is the habit of livestock or wildlife repeatedly treading in the same line or path (Range Term Glossary Committee, 1974).

TRAMPLING. The damage to plants or soil caused by movements or congestion of animals (Range Term Glossary Committee, 1974).

TRANSPIRATION. The giving off of water vapor from plants.

TRESPASS. The grazing of livestock on a range area without proper authority as a result of a willful or negligent act. Trespass includes the following: (1) grazing an excess number of livestock, (2) allowing livestock in the wrong areas, or (3) grazing livestock at an unauthorized time of year.

UNDERSTORY. Plants growing under a more or less continuous cover of branches and foliage formed collectively by the upper portions of adjacent trees and other woody growth.

UNGULATES. Hoofed mammals, most of which are herbivores and many of which have horns.

UNIT RESOURCE ANALYSIS (URA). The system of data gathering and analysis that precedes land use planning for public lands.

UPLAND EROSION. Loss of soil from upland areas, topographically above stream channels and washes. See Channel Erosion.

UPLAND GAME. Game whose habitat is elevated above lowlands associated with rivers and valleys. The EIS area has four upland game birds: Gambel's quail, band-tailed pigeon, and mourning and white-winged doves.

USABLE FORAGE PRODUCTION. All properly grazed browse and herbaceous vegetation usable by grazing animals, including forage unavailable to livestock because of inaccessibility or dietary limitations. Usable forage production is measured in air dry pounds.

USE (GRAZING). The amount of forage consumed and destroyed by grazing animals, usually expressed in animal unit months.

UTILIZATION (FORAGE). The percentage of current year's forage consumed or destroyed by grazing animals.

VEGETATION TYPE. A plant community with distinguishable characteristics, described by the dominant vegetation present.

VIABILITY. The capability of a seed, spore, egg, or other organ of a plant or animal to continue or resume growth when it is exposed to favorable environmental conditions (Hanson, 1962); having the ability to grow, expand, or develop.

VIGOR, PLANT. The relative well being and health of a plant as reflected by its ability to manufacture sufficient food for growth and maintenance. Vigor is reflected mainly by the size of a plant and its parts in relation to its age and environment.

VISITOR DAY. 12 visitor hours, which may be aggregated continuously, intermittently, or simultaneously by one or more people.

VISUAL RESOURCE MANAGEMENT (VRM) CLASSES. Classification containing specific objectives for maintaining or enhancing visual resources, including the kinds of structures and modifications acceptable under established visual goals.

WARM-SEASON PLANT. A plant whose growth period or major portion thereof occurs in summer and fall and that is usually dormant in the winter and spring. See Cool-Season Plant.

WATERSHED. The total area above a given point on a stream that contributes water to the flow at that point.

WATER TABLE. The upper limit or the part of the soil or underlying rock material that is wholly saturated with water.

WILDERNESS. An uncultivated, uninhabited, and usually roadless area set aside for preservation of natural conditions. According to Section 2(c) of the Wilderness Act of 1964,

> A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

WILDERNESS STUDY AREA (WSA). A roadless area or island that has been inventoried and found to have wilderness characteristics as described in section 603 of FLPMA and section 2(c) of the Wilderness Act of 1964.

WORKYEAR. An estimate of the work of one full-time employee for a 1-year period, regardless of the number of part-time employees who might actually do the work. A workyear comprises 2,600 hours.

YEARLING OPERATION. A livestock operation in which a herd of weaned steers and heifers are grazed from 3 to 9 months and then sold to feedlots or as breeding stock.

YEARLONG GRAZING. Continuous grazing for a 12-month period or for a calendar year.

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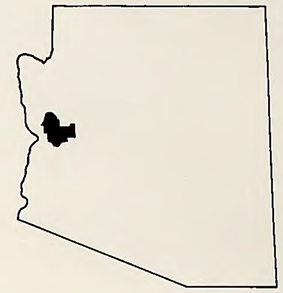
INDEX

Cover and divider illustrations (except for glossary, references and index) were drawn by Marilyn Hoff Stewart.

PLATE 1

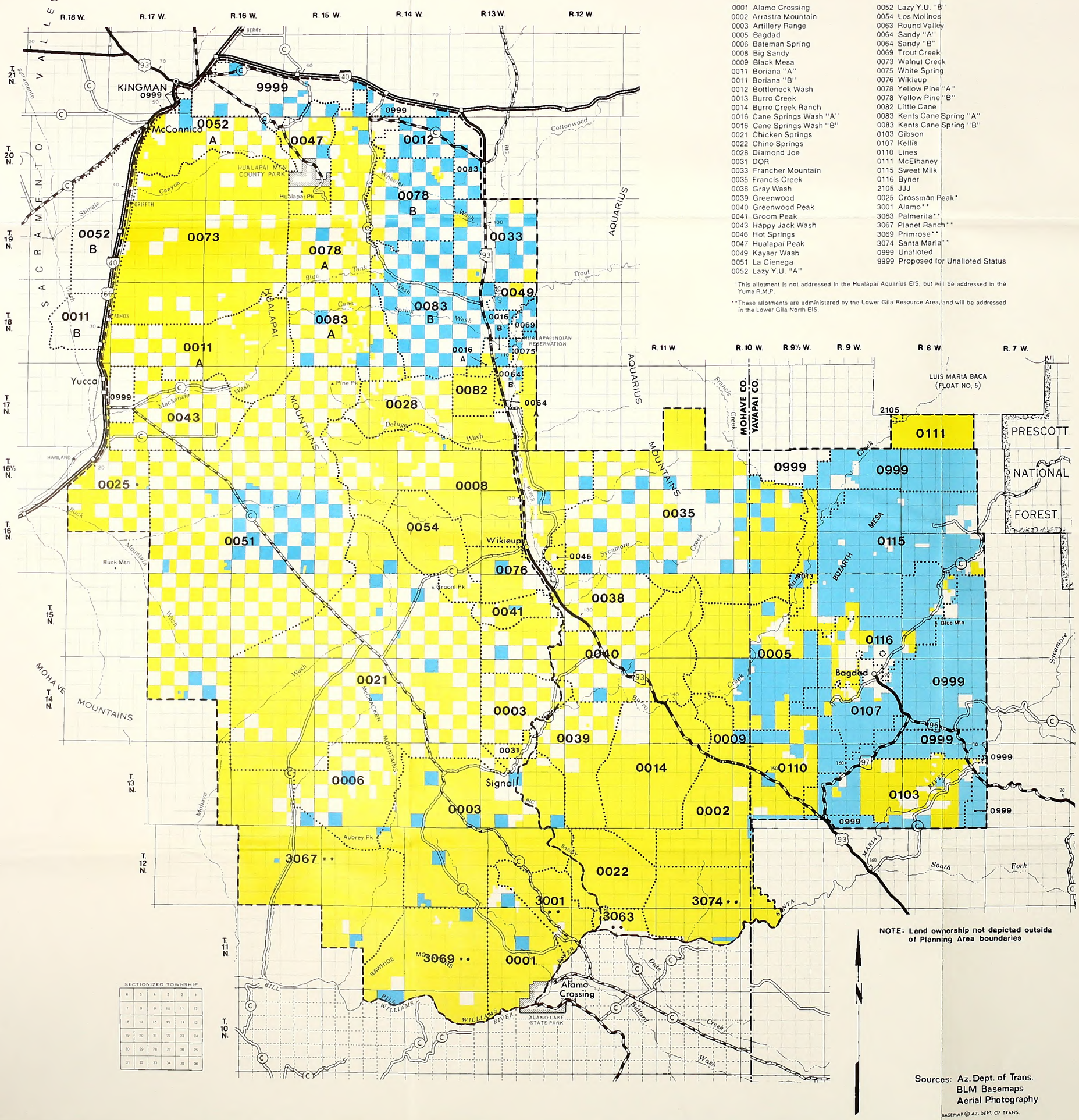
GRAZING ALLOTMENTS



0001 Alamo Crossing
0002 Arrastra Mountain
0003 Artillery Range
0005 Bagdad
0006 Bateman Spring
0008 Big Sandy
0009 Black Mesa
0011 Boriana "A"
0011 Boriana "B"
0012 Bottleneck Wash
0013 Burro Creek
0014 Burro Creek Ranch
0016 Cane Springs Wash "A"
0016 Cane Springs Wash "B"
0021 Chicken Springs
0022 Chino Springs
0028 Diamond Joe
0031 DOR
0033 Francher Mountain
0035 Francis Creek
0038 Gray Wash
0039 Greenwood
0040 Greenwood Peak
0041 Groom Peak
0043 Happy Jack Wash
0046 Hot Springs
0047 Hualapai Peak
0049 Hualapai Wash
0051 La Cienega
0052 Lazy Y.U. "A"
0052 Lazy Y.U. "B"
0054 Los Molinos
0063 Round Valley
0064 Sandy "A"
0064 Sandy "B"
0069 Trout Creek
0073 Walnut Creek
0075 White Spring
0076 Wikieup
0078 Yellow Pine "A"
0078 Yellow Pine "B"
0082 Little Cane
0083 Kents Cane Spring "A"
0083 Kents Cane Spring "B"
0103 Gibson
0107 Kellis
0110 Lines
0111 McElhaney
0115 Sweet Milk
0116 Byner
2105 JJJ
0025 Crossman Peak*
3001 Alamo**
3063 Palmerita**
3067 Planet Ranch**
3069 Primrose**
3074 Santa Maria**
0999 Unalloted
9999 Proposed for Unalloted Status

*This allotment is not addressed in the Hualapai Aquarius EIS, but will be addressed in the Yuma R.M.P.

**These allotments are administered by the Lower Gila Resource Area, and will be addressed in the Lower Gila North EIS.



LEGEND

- PUBLIC LAND
- STATE LAND
- PRIVATE LAND
- Planning Unit Boundary
- Allotment Boundaries
- DIVIDED HWY.
- BITUMINOUS OR CONCRETE
- BITUMINOUS SURFACE TREATED
- GRAVEL
- GRADED AND DRAINED
- UNIMPROVED
- CONNECTING ROADS
- ROUTE MARKERS: INTERSTATE, U.S. STATE, INDIAN, COUNTY
- MILEPOST
- NATIONAL FOREST
- INDIAN RESERVATION
- NATIONAL MONUMENT AND PARK
- LAND GRANT
- NOGALES — COUNTY SEAT
- PATAGONIA — INCORPORATED CITIES
- Sonoita — OTHER TOWNS OR VILLAGES
- AIRPORT: FACILITIES
- AIRPORT: NO FACILITIES

SECTIONIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

NOTE: Land ownership not depicted outside of Planning Area boundaries.

SCALE
5 0 5 10 15
STATUTE MILES

Sources: Az. Dept. of Trans.
BLM Basemaps
Aerial Photography

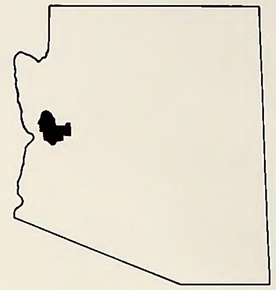
BASEMAP © AZ. DEPT. OF TRANS.

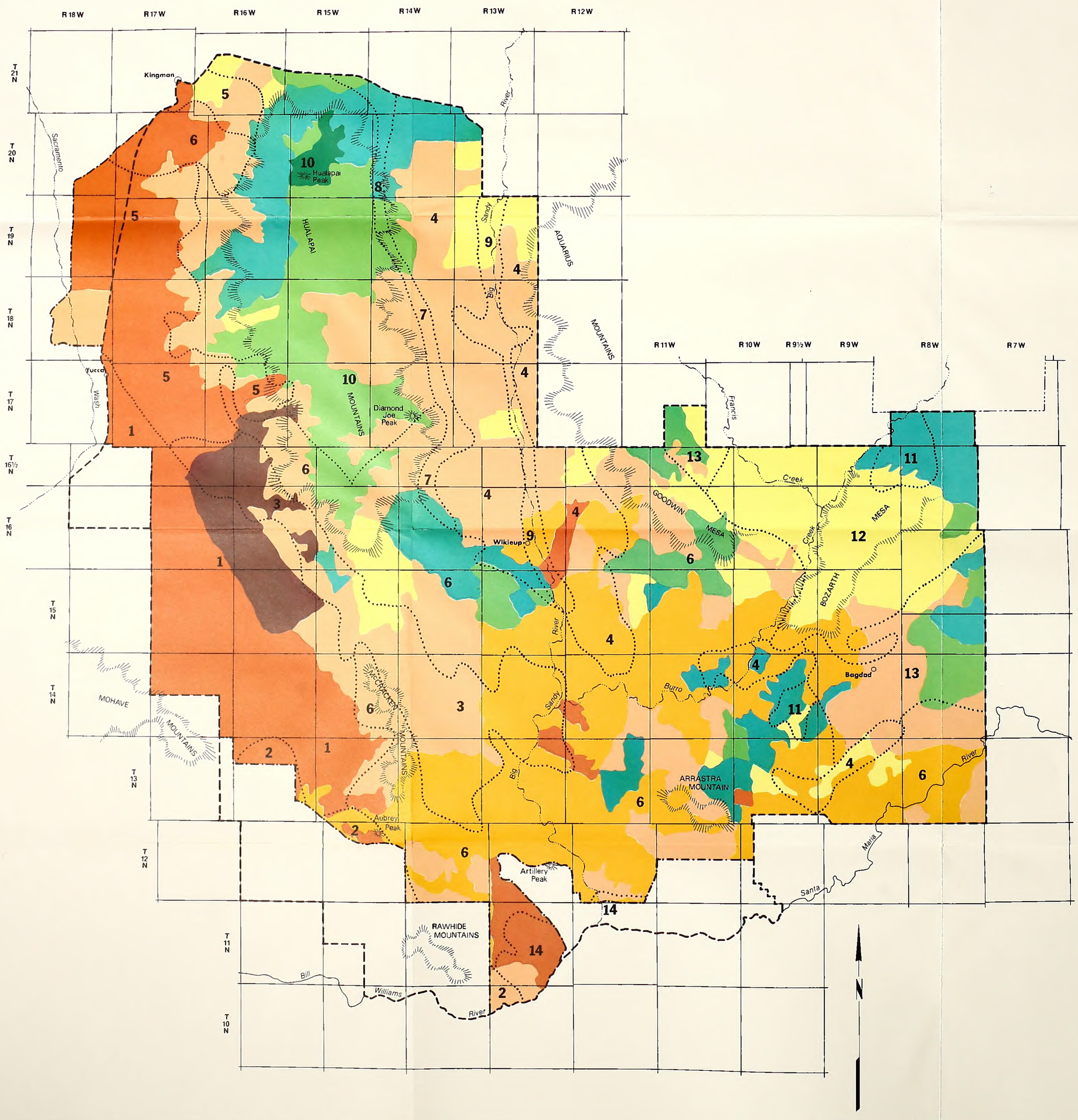
HUALAPAI-AQUARIUS PLANNING/EIS AREA

1979

U.S. Department of the Interior
Bureau of Land Management - Phoenix District

PLATE 2





LEGEND

SOIL ASSOCIATIONS

1. Hayhook(Variant)-Cave
2. Schenco-Lomitas-Rock Outcrop
3. Cave-Hayhook-Continental
4. Cave-Rillino-Continental
5. Ceve-Rillino
6. Cellar-House Mountain-Rock Outcrop
7. Eba-Continental
8. Lonti -Pastura-Abra
9. Arizo-Anthony-Latene
10. Faraway-Frees-Rock Outcrop
11. Luzena-Faraway-Rock Outcrop
12. Springerville-Cabezon-Thunderbird
13. Barkerville-Gaddes-Rock Outcrop
14. Cave-Rillito

VEGETATION TYPES

- Chaparral
- Creosotebush
- Desert Shrub
- Grassland
- Joshua Tree
- Paloverde
- Pinyon-Juniper
- Ponderosa Pine

- Planning Unit Boundary
- EIS Boundary
- Soil Association Boundary
- DIVIDED HWY.
- BITUMINOUS OR CONCRETE
- BITUMINOUS SURFACE TREATED
- GRAVEL
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- AIRPORT: NO FACILITIES

SCALE

5 0 5 10 15

STATUTE MILES

HUALAPAI-AQUARIUS
PLANNING/EIS AREA

1980

U.S. Department of the Interior

Bureau of Land Management - Phoenix District


U.S. DEPARTMENT OF THE INTERIOR
MARCH 3
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BUREAU OF LAND MANAGEMENT